SCIENTIFIC AMERICAN

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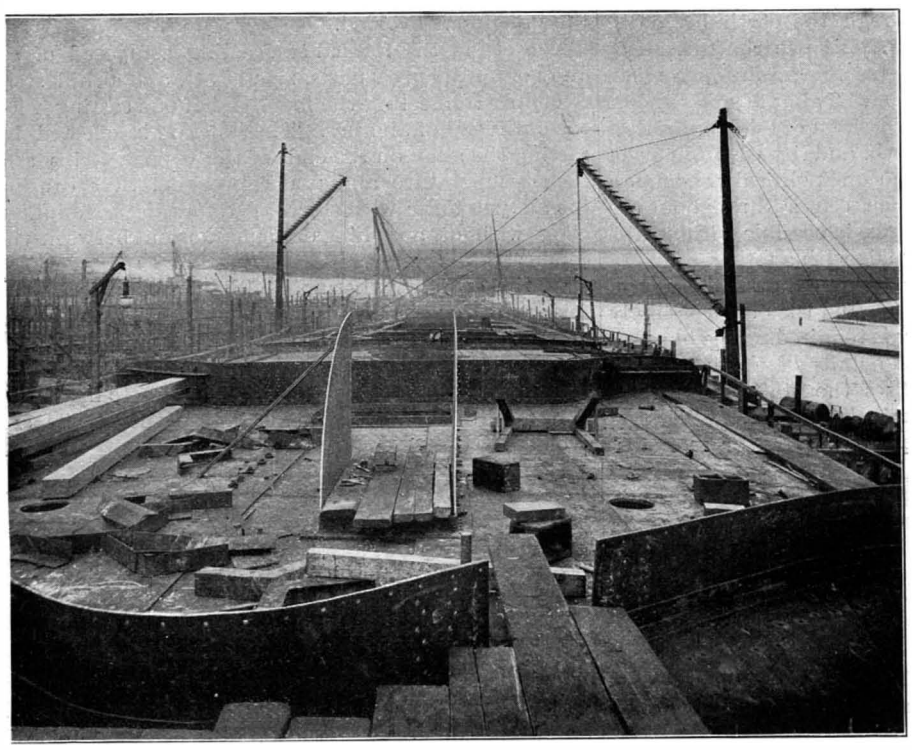
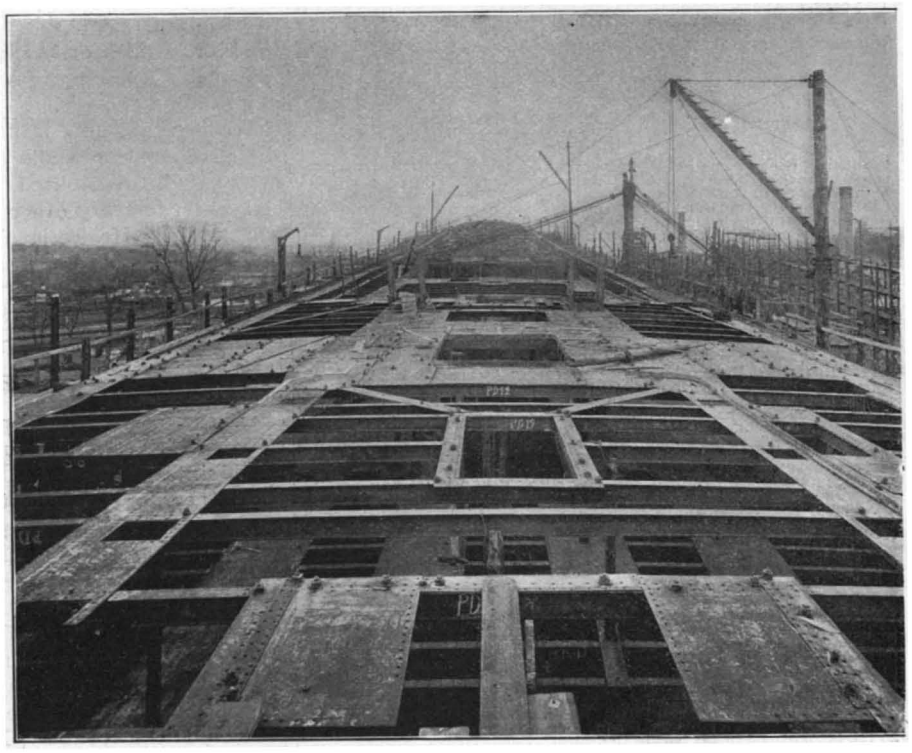
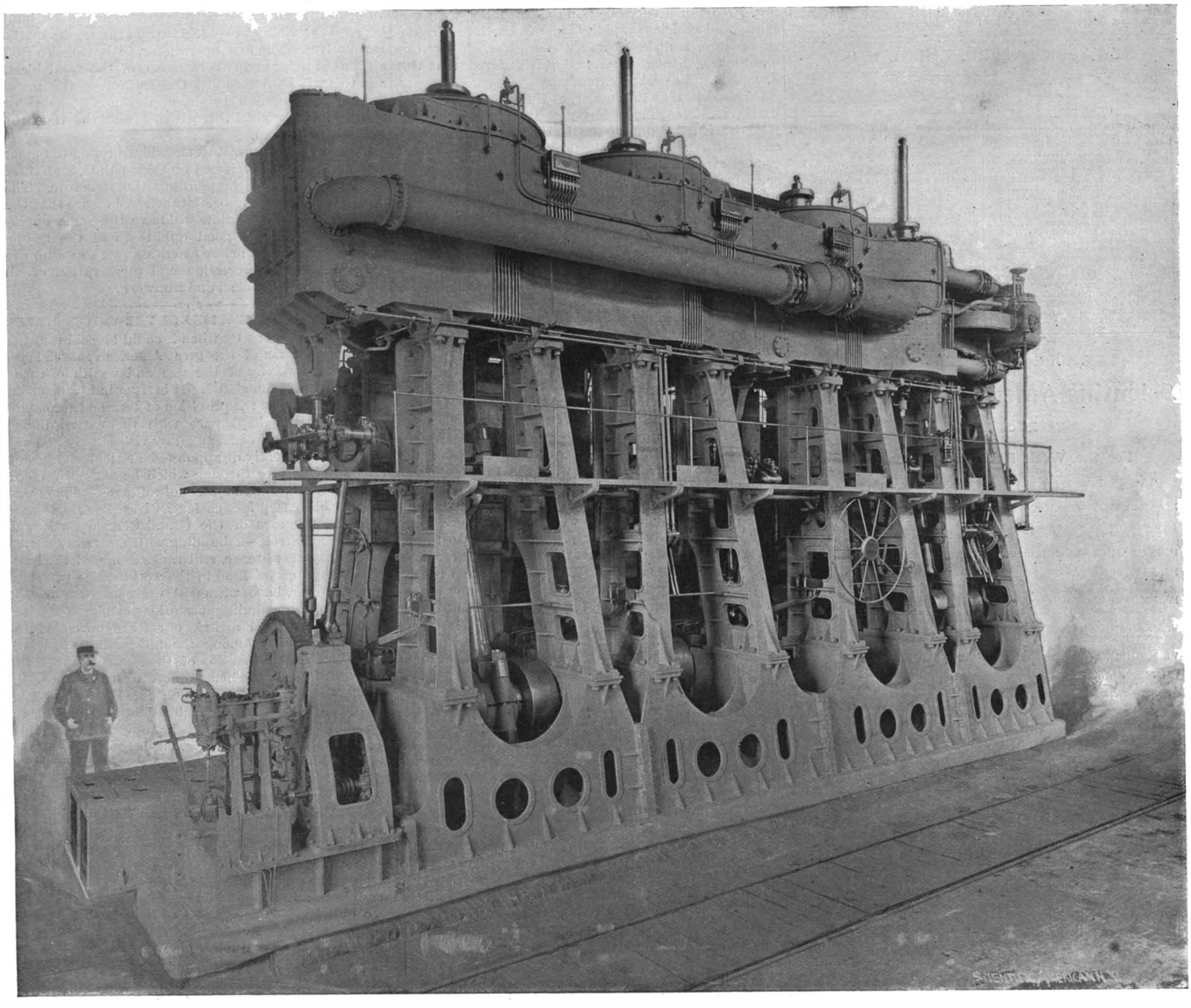


CONSTRUCTION OF THE KAISER FRIEDRICH—VIEW FROM THE BOW, LOOKING AFT.



THE KAISER FRIEDRICH, LOOKING TOWARD THE BOW—DECK LENGTH, 599 FEET.



FOUR-CRANK TRIPLE EXPANSION ENGINES OF THE KAISER WILHELM DER GROSSE.—[See page 388.]

Horse power, 28,000. Cylinders: One 52 inch high pressure, one 89¾ inch intermediate, two 96½ inch low pressure.

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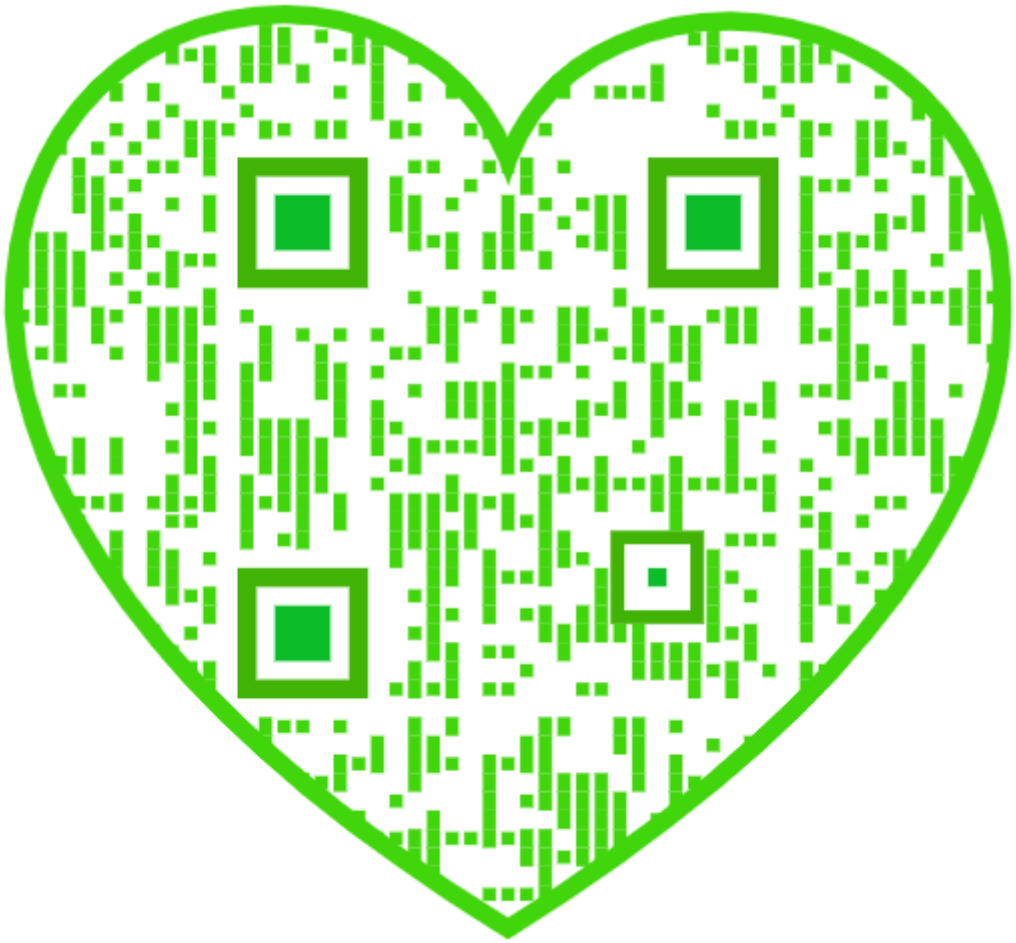

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WIRELESS TELEGRAPHY.

The discoveries and inventions of Nikola Tesla have excited much interest in the scientific world, and, notwithstanding the fact that he has been very reticent regarding his achievements and prospective improvements, hints of his purposes have been dropped occasionally; so that so much of the public as is interested in him or his discoveries has been able to form a fair idea of the nature of his work. His inventions in the line of alternating current generators and motors are now well known, but his experiments in currents of high frequency and high potential are not so familiar.

Very recently Mr. Tesla has announced that he has completed his wireless telegraph to such an extent as to permit of telegraphy through the earth for a distance of 20 miles or more, and his experiments satisfy him of the feasibility of wireless telegraphy on a much more extended scale. In fact, he aims at nothing less than the establishment of a system of telegraphy that shall include the whole earth, and by which items of news may be distributed from one political or commercial center to every other such center throughout the world. This, Mr. Tesla claims, is possible without the interference of one set of signals with another.

He has constructed and tested both transmitting and receiving apparatus, and has found that a surprisingly small expenditure of energy is required. It is impossible at this writing to secure details of the apparatus, but it is known that he utilizes the static equilibrium of the earth. This he disturbs at one point, making signals which can be distinguished at one or more distant points.

In his earlier experiments in high frequency currents Mr. Tesla attained a frequency of 10,000 per second; now 2,000,000 oscillations per second is not deemed extraordinary. It is said that the success of the system is assured, but he will not come before the public until every detail is completed. It is understood that the transmission of power from place to place by means of a similar system is contemplated.

While Mr. Tesla has been wrestling with this great problem in this country, Mr. Marconi, a young Anglo-Italian, has been working on the same line in England under the direction of Mr. Preece. It is reported that Mr. Preece has succeeded in telegraphing with certainty and sufficient rapidity from Penarth to Weston-super-Mare, a distance across the water of seven or eight miles, without wires, and it is believed that this distance can be greatly extended.

It is said by The Engineer that the apparatus devised by Marconi is extremely ingenious, and has for its object the getting out of the Hertzian vibrations sufficient work for telegraphic purposes. The apparatus comprises a transmitter and receiver. The former consists mainly of a small Ruhmkorff induction coil excited by a couple of battery cells. The secondary or high tension wires terminate each in a metallic ball. Between the two balls is placed a cubical box containing oil. In the opposite sides of the box are fixed two brass balls, oiltight, so that one-half of each ball is in the oil in the box and the other half outside of the box. The balls do not touch. The whole arrangement has been designed by an Italian professor, Righi. On sending a current through the induction coil, Hertzian vibrations are set up in the balls and communicated to the ether. The oil has a peculiar effect, acting as a species of brake, the rapidity of the wave vibrations being only about one-half of that stated by Dr. Lodge. These vibrations are then given off into space all around in every direction. So far as known, nothing save metals appears to be opaque to them, and here, therefore, we have an analogy with the Roentgen ray.

Marconi's receiver consists of a tube about ¼ of an inch in diameter and 3 inches long, in which are two silver plugs terminating in wires, the ends of which are soldered to the silver plugs. The wires are fused into the glass. The tube is exhausted to a near approach to absolute vacuum. The faces of the two silver plugs are very close to each other, and the space between is filled up with an impalpable metallic dust. On the nature of this dust much depends. It must suffice to say that there are in it three constituents, one of which is nickel. Under ordinary conditions this powder will not conduct electricity, save feebly. Its resistance is very high. If a Hertzian ray falls on the little tube, the dust is polarized like the filings in a Hughes test tube, and the powder becomes a conductor. It will be seen at once that we have here a make and break which can be acted on from a distance, and an ordinary Morse sounder does the rest. But matters, after all, are not quite so simple. It is easy to dispatch into space Hertzian waves at intervals corresponding to dots and dashes, but the powder in the receiver, once polarized, remains polarized. To get over this obstacle, a tiny hammer is so arranged that, the moment a current passes through the tube, the hammer taps the side of the tube and depolarizes the powder ready for the next signal.

There is nothing in common between ethereal or wireless telegraphy and telegraphy by induction; the phenomena are wholly distinct. The Hertzian radiance is akin to light, and the polarization of the powder in the receiver finds its analogue in the molecular change which is wrought by light in a sensitized plate.

DIRECT CONVERSION OF HEAT INTO ELECTRICITY.

Mr. H. Barringer Cox lately delivered a lecture before the New York Electrical Society, on the direct conversion of heat into electricity. The lecturer has recently commenced in England the manufacture of thermopiles on a commercial scale. These thermopiles are designed to give a large current output without regard to voltage, and with the least possible expenditure of heat. Another important feature of the pile is the peculiar construction of the junction of the members of the elements, by which rapid deterioration at the junction is avoided.

The element is formed of a casting composed of an alloy of antimony 2 parts, zinc 1 part, and a thin strip of copper connecting the inner end of one casting with the outer end of another. The junction is effected by casting the alloy on the ends of the copper strips at a high temperature and under pressure, thus causing the alloy to unite with the copper, forming a graduated alloy without any line of demarkation between the copper and the alloy.

In the ordinary thermopile the junction is at the surface, and the transmission from metal to metal is abrupt. This form has been considered very effective. Mr. Cox has found that this is a mistake, and that by utilizing the graduated junction according to his invention, most of the imperfections of the thermopile are avoided.

PAINT AS A PROTECTION TO METALLIC STRUCTURES.

The Department of Public Works of New York City is about to carry out a test of the preserving qualities of various kinds of paint which will be of the greatest interest to all engineers and builders, and should provide them with some much needed data. The experiments are to be made on a massive steel viaduct which carries One Hundred and Fifty-fifth Street across the elevated tracks of the Manhattan Railway Company. The test is to be carried out in a thoroughly scientific and practical manner, and great care will be taken to shut out any disturbing element which might affect the value of the results. A tight board roof will be built beneath the viaduct to shield it from the smoke of the locomotives. The first operation will be to clean off all the old paint and rust by means of the sand blast, and this will be done until the surface of the metal presents a clean and bright appearance. The paint will be put on within three hours from the time the cleaning is finished.

The various manufacturers will be invited to tender bids and provide specimens of their paints, and these samples will be used in painting the structure. The precautions which are being taken will insure that the different varieties of paints will have the same opportunities to show their good qualities, and the results will be watched with close attention by those who are responsible for the erection and preservation of all classes of structural steel and ironwork.

GREAT PASSENGER STATIONS OF THE UNITED STATES.

The time has gone by when it could be said that the passenger stations of the great American railroad system were unworthy of the size and wealth of roads which they accommodated. It is true that previous to the present decade the provision of terminal accommodation had not kept pace with the extraordinary growth of the railroads, and any visitor to our shores was apt to be greatly disappointed at the insignificant terminal structures through which he was introduced to our world-renowned system of railroads. There was one notable exception, as far as New York was concerned, in the case of the Grand Central station, at Forty-second Street—a building which, after a quarter of a century of existence, still ranks as one of the largest buildings of its kind in the world. The past few years, however, have witnessed the construction of a series of truly magnificent stations, which for size, accommodation, and artistic effect are unrivaled by anything abroad. Among the most notable of these are the Broad Street station of the Pennsylvania Railroad, with its great arched span of 300 feet, total length of 592 feet, and accommodation for 16 tracks. The Philadelphia and Reading Railroad terminal station in the same city is not so wide, being only 260 feet, and it accommodates two tracks less, but it is remarkable for its enormous length of 800 feet. A considerably larger structure is the North Union station at Boston, which covers 23 parallel tracks, is 460 feet wide and 500 feet in length. This, again, is greatly surpassed by the Union station at St. Louis, which easily takes rank as the largest structure of the kind in the world. It is 600 feet in width, 630 feet in length and accommodates 30 tracks. The dimensions given above are for the train sheds alone, and do not include the waiting rooms and office buildings. The St. Louis station, however, will be eclipsed in size by the South Terminal station at Boston, which is to provide for 28 tracks under a roof which will be 650 feet wide and 710 feet long. From these figures it can be seen that it will take 10½ acres to accommodate the train shed alone.

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THE LONDON BLACKWALL TUNNEL.

On the 22d of May last this latest example of shield driven tunnels was dedicated for public travel in London, in the presence of their Royal Highnesses the Prince and Princess of Wales, and the London County Council and other dignitaries. We are indebted to Mr. Maurice Fitzmaurice, one of the resident engineers, for a pamphlet giving a brief description of the tunnel.

It appears in London there are very few free bridges across the Thames. This tunnel built under the Thames is the only free crossing between the Tower Bridge and the Woolwich Free Ferry, a distance of nearly nine miles, and will be largely used because of the large population of London east of the London Bridge. The tunnel is constructed of iron plates bolted together, lined on the inner surface with white glazed brick, and has an external diameter of 27 feet—one of the largest shield driven tunnels ever built. The roadway inside is 16 feet wide, with head room above the center of 17 feet 6 inches. On each side are footpaths for pedestrians. Under the roadway is a space reserved for sewers, gas and water pipes.

The tunnel proper is 6,200 feet long and is lighted throughout by electricity brilliantly enough so that a newspaper can easily be read in any portion.

In the SCIENTIFIC AMERICAN SUPPLEMENT, No. 1025, is illustrated the great hydraulic steel shield used in the building of the tunnel under the banks and the bed of the river. Several unusual difficulties were encountered, one being the giving way of the river bed above the shield and letting in the water. This was prevented or overcome in a measure by dumping clay soil into the river over the path of the shield, which kept the bed compact. After the tunnel was finished the extra layer of clay on the bed was dredged out. Compressed air was also used in the front section of the shield to drive back the water and protect the workmen during the excavation, especially in tunneling through a gravel soil. A transverse steel partition provided with several doors in the front portion formed a watertight bulkhead in an emergency, the earth being shoveled through the different doors as occasion required.

On driving the shield (weighing 250 tons) forward by hydraulic rams, the enormous water pressure of two and three-quarter tons to the square inch was used, and at times it was over 5,000 tons. The portion of the tunnel under the river was built in one year, or at an average rate of 100 feet per month. The total cost was a trifle over $4,000,000. Another important fact is that the entire work was completed within the original estimate or contract tender. A summary of the materials used is as follows: Cast iron, 17,000 tons; bricks, 7,000,000; white glazed tiles, 1,000,000; cement, 20,000 tons; concrete, 110,000 tons; asphalt, 5 acres; electric light cables, 12 miles; earth excavated, 500,000 tons.

There is no question but what the tunnel will be of great utility to the population of London, and the council, promoters and engineers deserve great credit for their perseverance in pushing the work to completion.

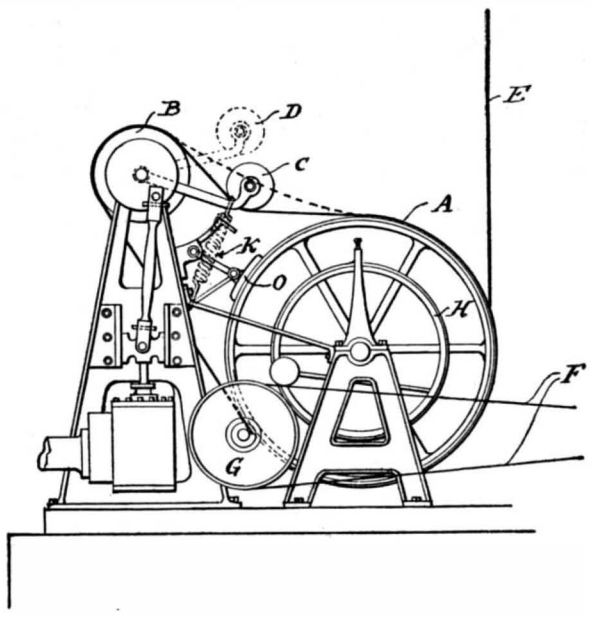
FALL OF AN ELEVATOR IN THE POST OFFICE BUILDING, NEW YORK.

The fall of a freight elevator last week in the general post office, New York, is one of those cases of failure which possess a special interest for the mechanical engineer. By the courtesy of Lieut. A. B. Fry, Chief Engineer and Superintendent of Repairs, United States Buildings, New York, we have examined the elevator and are enabled to present our readers with an outline sketch of the hoisting machinery and a detailed account of the causes which led up to the accident.

The elevator, which is located on the Park Row side of the building and near the northeast corner, is one of two duplicate elevators which are used for carrying freight, mails, and post office employes. It runs from the basement to the top floor. On the morning in question it started from the basement with 1,500 pounds of plaster in bags, two laborers, a post office employe, and the elevator man—a total estimated load of about 2,150 pounds. A stop was made at what is known as "the gallery," the first landing above the ground floor, and here two more railway mail clerks entered the car. The elevator man pulled the shipper rope for a further ascent, when the car almost instantly fell to the bottom of the shaft. On striking it rebounded, according to some of the occupants as high as five feet, and according to others only a foot or two. The two hoisting ropes, which broke at the drum, then ran up over the top sheave and fell upon the car. All the occupants were more or less seriously injured by the drop of forty feet and by the falling of the steel ropes upon them.

At the time of the accident there was a live load of about 2,400 pounds on the car, and it was naturally supposed that the strain had proved too much either for the ropes or some part of the overhead gear or hoisting engine. An examination of the wreck showed that the overhead gear and the hoisting machinery were intact, but that the two ¾ inch steel ropes had parted at a point about 14 inches from the clamps which fastened them to the drum. At first sight it looked as though this rupture of the ropes was the direct cause of the disaster; but on closer examination two circumstances were noted which rendered this very improbable. For in the first place the breaking strength of the ropes was fully seven times greater than the combined weight of the car and its load—about 3,700 pounds—and moreover the ropes were both found to be in excellent condition at the point of rupture. One of these had been in service eight or nine months and the other about eighteen months, the life of a rope subject to such service as these being from three to five years. Another consideration which makes it impossible that the ropes failed from the direct pull of the car is the fact that when the latter commenced to fall there were six or seven turns of the rope wound upon the drum between the point of subsequent rupture and the point at which the rope left the drum and ascended the elevator shaft. Even when the car was on the sub-basement floor there were one and a half turns on the drum, and hence a considerable amount of the strain would be transferred by friction to the drum and would never reach the rope at the point of rupture.

If it was not the failure of the ropes, what caused the fall of the car? The theory accepted by the engineer is that it was due to slipping of the belt which connects the engine shaft and the drum, and that this was caused by a heavy load combined with awkward handling. By reference to the accompanying sketch of the hoisting engine, a McAdams & Cartwright machine, it will be seen that the drum, A, is driven by a belt from the pulley, B, on the crank shaft of a two cylinder vertical engine. The tension of the belt is regulated by the deadweight of an idler or belt tightener, C, which is carried by a couple of arms hinged to the crank shaft. The hand ropes, F, leading through the car pass over a "shipper" pulley, G, on whose shaft is a gear wheel which operates a horizontal rack on



SKETCH OF POST OFFICE ELEVATOR HOISTING ENGINE.

the valve stem of the engine. Attached to the same shaft is a cam which lifts a weighted arm when steam is admitted to the engine and releases the strap brake, H. A separate check rope is also provided by which the brake can be thrown full on in cases of emergency—which latter device, unfortunately, the operator failed to apply when the car started to fall. Another powerful brake, K, is provided, which is brought automatically into action if the belt should carry away, in which case it would be set hard against the pulley by the fall of the idler.

Regarding the slipping of the belt and the consequent fall of the car, it must be remembered that the latter is not counterbalanced, and, consequently, when the brake, H, is raised there is nothing to prevent the car from falling but the belt friction. It has been found by careful test that by suddenly jerking the hand ropes and giving the engine a full feed of steam, the sudden start of the pulley, B, especially with a heavy load, will throw the idler clear of the belt into the position, D, shown by dotted lines. This slacks the belt and leaves the drum momentarily free to unwind. Under average moderate loads the jump of the idler is small, and scarcely sufficient to affect the action of the belt; but on this occasion, when the load was exceptionally heavy, it is supposed that the operator instinctively gave a heavy pull at the hand rope and threw the idler high enough to allow the car time to commence its descent. By the time it fell upon the belt again the car would have acquired great momentum and the idler would simply rebound from the belt. Practically the only check upon the descent of the car would be that due to the friction and the inertia of the drum, which weighs about 600 pounds, and the velocity of the car, which, as we have said, was not counterbalanced, would be very nearly that due to its falling freely through a space of 40 feet. By the time it reached the bottom of the shaft the ropes were unwound from the drum, and the bruised appearance of the strands at the break indicate that they were entangled and cut through either at the first descent or on the rebound of the car.

It is evident that, whether this is the true explanation of the disaster or not (and it is quite compatible with the facts and subsequent tests), the weak point in this system of elevator lies in the uncertain nature of the tension on the belt. The defect can be remedied by inserting a stiff coil spring between the idler and the engine frame, as shown in dotted lines in the sketch. This is to be done in the case of the two engines at the post office, and it is a precaution that should be adopted as a measure of safety in the case of all hoisting engines that are operated on this plan.

DEATH OF ALVAN G. CLARK.

Alvan G. Clark, the famous telescope lens maker and astronomer, died suddenly of apoplexy at his home at Cambridge, Mass., on June 9. Mr. Clark had returned from Chicago two weeks before, after placing the famous objective in position in the great telescope tube at the Yerkes Observatory, at Williams Bay, Wis. A short time before the trip he had a slight stroke of paralysis, but recovered in a few days.

Mr. Clark will be the last of the famous lens makers. He was born at Fall River, Mass., in 1832. After a grammar school education he became associated with his father and brother in the manufacture of telescopes, the factory being at Cambridgeport, Mass. When Alvan Clark, the founder of the firm of Alvan Clark & Sons, died in 1887, just after the firm had completed the great telescope lenses for the Lick Observatory, Alvan Graham Clark became the head of the firm. Among the lenses completed under his supervision was the 26 inch lens in the Naval Observatory at Washington and the 30 inch refractor for the Imperial Russian Observatory. For the latter work Mr. Clark was decorated by the Czar. The most important objective which Mr. Clark ever undertook was the lens for the great telescope of the Yerkes Observatory. This is the greatest refracting telescope ever made, the lens being 40 inches in diameter and the focal length 64 feet. The cost of the lens and fittings was about $65,000.

Mr. Clark was also an astronomer of high standing. In 1870 he accompanied the total eclipse expedition to Jerez, Spain, and he was a member of a similar expedition to Wyoming, in 1878. He discovered fourteen double stars, including the companion to Sirius, for which a gold medal was given to him by the French Academy of Sciences.

KITES AS AN AID TO DISCOVERY.

Prof. William Libby, Jr., of Princeton University, is about to undertake a unique exploring expedition, with a party of six. They expect to leave New York the first week in July, for Albuquerque, New Mexico. In the vicinity of this place rises from the alkali plains to a height of more than 700 feet a "mesa" or tableland of sandstone. The top of this has never been explored by white men, because the almost perpendicular walls make its summit inaccessible even to the most experienced mountain climbers. To students of archæology and anthropology, this tableland possesses great interest, because of the belief that it was once the home of a race of cliff dwellers. Articles of pottery have fallen from the top of the "mesa," so this belief seems reasonable. Prof. Libby and his party intend to explore the tableland, if it is a possible thing.

They will remain in camp at its base until they are either successful or are convinced that their endeavors are useless. They intend to avail themselves of several devices to reach the top. The first idea of Prof. Libby was to take a mortar with the expedition, and shoot a line over the "mesa" at its narrowest point, where it is only a few yards wide, the method being very similar to that adopted by the life-saving service. Recently, Prof. Libby became impressed with the utility of Mr. Eddy's kites, and the professor has visited Mr. Eddy relative to the matter. Prof. Libby will have material for a dozen of Mr. Eddy's kites prepared. They will be constructed for use in the extremely light winds prevalent in the vicinity of the lone tableland. He will ship the mortar, cables and other equipments for the expedition. If the cable can be successfully hauled over the "mesa's" summit the party will rig a boatswain's chair on the cable, and thus be able to ascend to the top of the tableland.

STATURE AND WEIGHT.

These anthropological elements are discussed in a highly satisfactory manner by Dr. Buschan, of Stettin, editor of the Centralblatt für Anthropologie, in the "Real Encyclopadie der Gesammten Heilkunde," now publishing in Berlin.

In America no tribe is mentioned with an average under 1·60. The tallest are undoubtedly American, some (doubtful) Caribs of the Orinoco at 1·84 and the Tehuelche of Patagonia at 1·78.

The article on the weight gives abundant information about the relative weight of the brain and other organs.

Both articles contain a very complete bibliography of the recent scientific literature of the subjects.

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THE NEW TWIN SCREW EXPRESS STEAMSHIPS OF THE NORTH GERMAN LLOYD COMPANY.

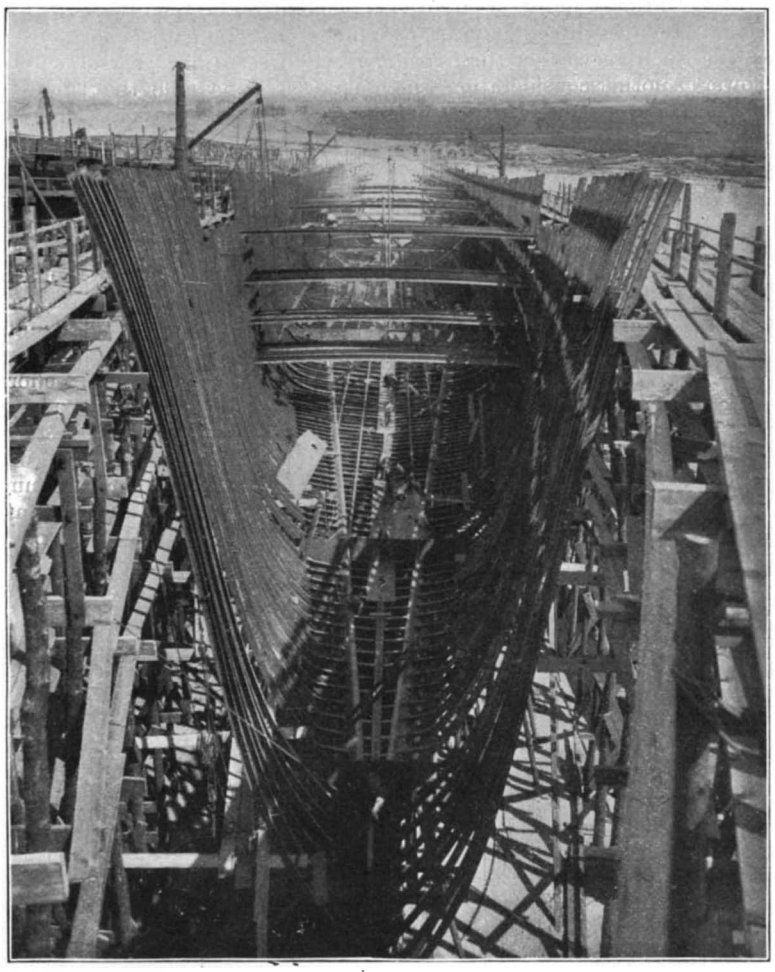
The year 1897 will be memorable in the history of the North German Lloyd Steamship Company and will mark a decided advance in the development of trans-atlantic travel; for at no period has any of the great steamship companies accomplished or even approached the feat of adding six first-class passenger steamers to its fleet in a single year. The performance is the more remarkable when we bear in mind that four of these ships are of over 10,000 tons register and between 500 and 600 feet long, and that two of them are to be over 600 feet in length and to show a speed of 22 knots on their trial. Moreover, if the calculations of her designer are correct, the queen of the new fleet will be the fastest as well as the largest steamer on the seas, and will enable her owners to hold the much coveted "blue ribbon" of the Atlantic until a successful competitor shall be launched by some other line.

The four boats of 10,600 tons and 15 knots speed will belong to what is known as "the Twin Screw Passenger Service of the North German Lloyd." The boats of this service combine great cargo-carrying capacity with a considerable accommodation for passengers, and although the speed is moderate, the service and general provisions for the comfort of the passengers are fully up to the first-class standard. The other two boats of the six are practically sister ships, the speed, horse power and accommodation being identical. The larger boat will be known as Kaiser Wilhelm der Grosse, and it is promised that she will surpass the boats that are now running on the Atlantic on every point of comparison. Her dimensions are as follows: Length over all, 649 feet; beam, 66 feet; depth, 43 feet; displacement, 20,000 tons; horse power, 28,000; and speed, 22 knots.

The motive power consists of two triple-expansion, four cylinder engines, each working on four cranks. The diameter of the cylinders is as follows: High pressure cylinder, 52 inches; intermediate cylinder, 89¾ inches; two low pressure cylinders, 96½ inches. To secure a perfect balance the four cranks are set 100°, 100°, 100°, and 60°, the odd dimension being adopted to compensate for the lighter weight of the low pressure piston. This arrangement is known as the Schlick system, and it is said to show very excellent results. The propellers are constructed of bronze. They are 22 feet 3¾ inches in diameter, with a pitch of 32 feet 10 inches, and each weighs 26 tons. The crank shafts and screw shafts are 24 inches in diameter. They were made at the famous Krupp establishment at Essen, and they are specially interesting as being constructed of nickel steel. The screw shafting is 198 feet in length.

The bedplate and framing is of cast steel, and it will be noticed that the air pumps and condensers are not connected to the main engines. In conformity with the latest practice, these are operated by separate engines and are placed in the wings of the ship. The small engine seen at the forward end of the main engine is for turning over the cranks. There is also a separate engine for starting and reversing. The two condensers have a total cooling surface of 35,522 square feet; they contain 11,060 separate tubes, which, if joined end to end, would comprise a length of 25 miles.

Steam is furnished by fifteen boilers, of which twelve are double enders. In addition to the vast machinery described above, there are in the engine and boiler rooms a large number of pumps and auxiliary engines, in which are included four large dynamos for electric lighting, a refrigerator pump, four powerful centrifugal pumps, two air pumps and many other compact machines which bring the total in the engine and boiler room alone up to forty-seven. In addition to these there are twenty-one engines located in various parts of the great ship, which are used for working the winches of the various cranes and hoists, and for operating the capstans, hoisting the anchors and performing the many operations connected with the berthing of an Atlantic liner.



THE FRAMING OF THE KAISER FRIEDRICH.

In the construction of the Kaiser Wilhelm der Grosse special attention has been paid to the question of safety, and it is reasonably concluded that she is not only unsinkable, but proof against complete disablement. She is divided by 16 transverse bulkheads, specially braced and stiffened, extending in every case to the upper deck, and her bottom for the whole of her length is constructed on the cellular principle. Her great reserve of flotation in case of collision, due to the above construction, is doubly assured by the enormous pumping capacity of the engine and boiler room plant. Should the plating be ruptured either by collision or grounding, it will be possible to connect a dozen powerful pumps with the leaking compartment, whose combined efforts can discharge 3,600 tons of water from the ship every hour. To guard against the danger of the incoming water flooding the furnaces of the boilers, and thus disabling all the pumps, the four groups of boilers are each placed in separate watertight compartments, so that the possibility of all the boilers being disabled at the same time is very remote. In her general appearance, as in her size and speed, the new boat resembles the Campania and Lucania more than any other liner at present in service. She has the same straight stem, graceful sheer (slightly increased over that of the Cunard boats), and two pole masts placed well forward and well aft. The chief difference in the appearance of the ships will be in the smokestacks, the Campania having two of 20 feet diameter and the Kaiser Wilhelm four of 12 feet 2 inches diameter, the former reaching to 120 feet above the grate bars and the latter 106 feet above the keel. Owing to the fact that the enormous size and height of the funnels in the Cunard boats somewhat dwarfs the other proportions of the ships, the palm for grace and beauty will probably be awarded to the new comer.

The Kaiser Wilhelm was built in the yards of the Vulcan Shipbuilding Company, Germany. The launching took place on May 4 of this year, and she is scheduled to make her first trip to New York on September 4.

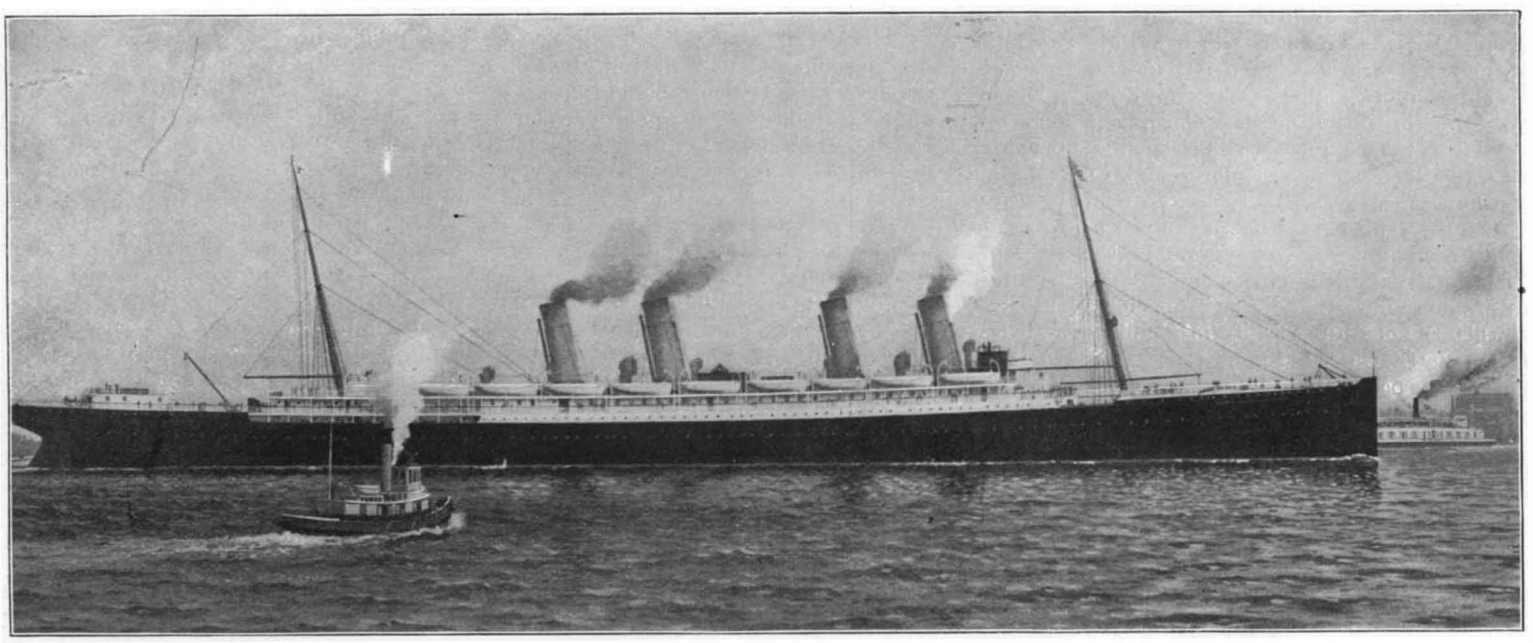
By the courtesy of the North German Lloyd Company we are also enabled to present our readers with views showing the construction of the sister boat, the Kaiser Friedrich, which will be placed on the route shortly after the Kaiser Wilhelm. She is being built by F. Schichau, of Danzig, Germany, whose uniform success in the construction of high speed vessels is a guarantee that the contract mark of 22 knots will be easily reached. As we have already explained, the Kaiser Friedrich is a sister ship only in point of passenger accommodation, engine power and speed, the Kaiser Wilhelm being of considerably greater displacement. For convenience of comparison the details of these boats are given in the same table with those of the Lucania, the new White Star liner Oceanic and the Great Eastern.

On looking over the dimensions, horse power, etc., one is led to select the Kaiser Friedrich as being likely to show the greater speed of the two new boats. It will be noticed that, although the Kaiser Wilhelm is of a thousand tons greater displacement than the Lucania, she is to be furnished with two thousand less horse power. On the other hand, she is twenty-five feet longer on the water line (twenty-nine feet longer over all), the ratio of beam to length in the case of the Kaiser Wilhelm being 9·5 and for the Lucania 9·2; moreover, it is probable that her lines are much finer than those of the present greyhound of the Atlantic.

	Length Over All.	Beam.	Depth	Displacement.	Horse Power	Sea Speed.
						Knots.
Great Eastern...	680 feet.	83½ feet.	58 feet.	32,160 tons.	6,000	11
Lucania.	620 "	65¼ "	43 "	19,000 "	*30,000	*22·01
Kaiser Wilhelm.	649 "	66 "	43 "	20,000 "	28,000	22
Kaiser Friedrich.	599 "	64 "	41 "	17,500 "	28,000	22
Oceanic	704 "	68 "	50 "	25,000 "	....	....

* Trial horse power, 33,000; trial speed, 23¼ knots.

In any case, it is certain that the close of the season will see an exciting struggle for the blue ribbon of the Atlantic, and it will be an interesting question as to how far the new German boats can exceed the performance of the Lucania, when, in 1895, she maintained an average speed across the Atlantic of 22·01 knots an hour.



THE KAISER WILHELM DER GROSSE.

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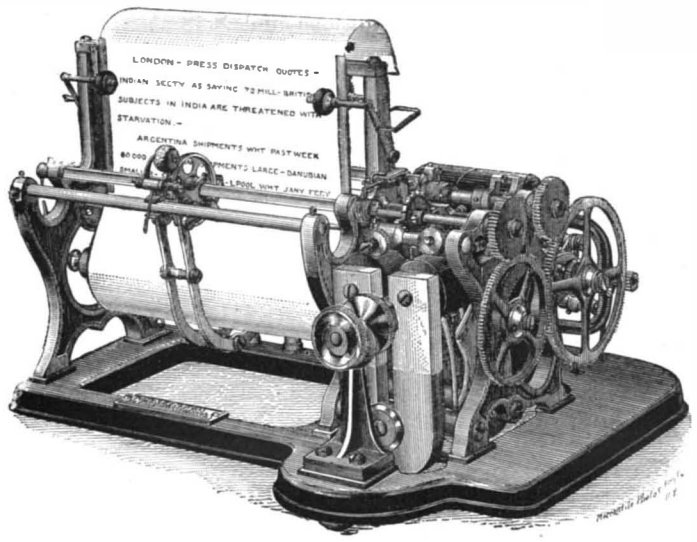
A NEW PRINTING TELEGRAPH INSTRUMENT.

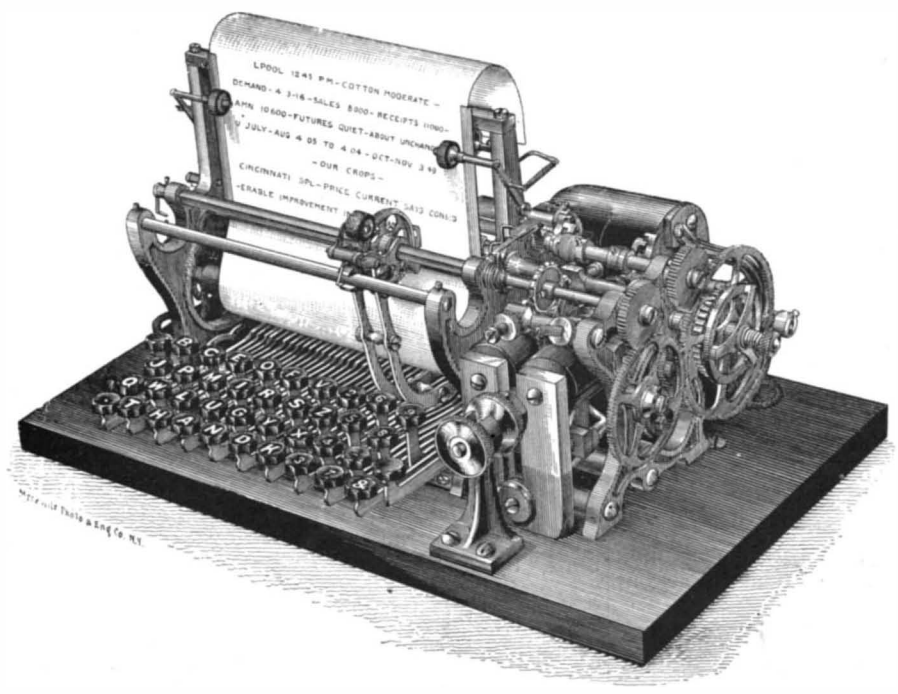
A printing telegraph instrument which is just being introduced, and which is as simple to operate as the ordinary typewriter, is shown in the accompanying illustrations, one of which represents a combined transmitter and receiver, and the other the receiver alone. It is of the class known as page printers, and prints on a sheet or roll of paper six inches wide, after the manner of a typewriter, a type of instrument which has attained considerable popularity during the past two years, but whose use has been restricted by its slow speed and the somewhat complicated details connected with its operation. By the new instrument herewith illustrated 2,200 words an hour are readily transmitted, as against only 900 or 1,000 words an hour by the old one, a perfect record being kept of the message sent in ordinary figures and alphabetical characters, and no attention whatever being necessary at the receiver. Its simplicity and reliability especially commend it for use on railroads and on private lines, no expert operator being required, as well as for all purposes where the ordinary tickers are employed. The instrument is covered by numerous patents, and is being placed before the public by the Printing Telegraph News Company, of New York. More than thirty of the new instruments have recently been put into daily use in Chicago, and 200 more are almost completed ready for shipment for the same city, to be placed in immediate service. The instruments and switchboards are all made in the shops of the company in New York City.


LONDON - PRESS DISPATCH QUOTES -
INDIAN SECTY AS SAYING
SUBJECTS IN INDIA ARE THREATENED WITH
STARVATION -
ARGENTINA SHIPMENTS WHT PAST WEEK

RECEIVER—NEW PRINTING TELEGRAPH.

The transmitter, with the generator of electricity, may be regarded as forming one part of the system, the receiver, with the line wire, forming another part, in the transmission of messages to a distance, but these two parts are united in the combined instrument. A small electric motor takes the place of the weights and springs formerly used, and the electric power necessary may be obtained by simply attaching it to an ordinary direct current incandescent lamp socket, the current being controlled by suitable resistance, thus doing away with the care and maintenance of batteries. The transmitter sends out impulses of current—each in reverse direction to the next preceding or succeeding one—and controls the number sent out. It has a pin cylinder, rotated, when released, by the motor, and a keyboard with 39 keys, the upper left hand one being a unison key to release the pin cylinder and allow it to revolve indefinitely. A lower left hand space key stops the pin cylinder at a blank point with which the printing mechanism of the receiver is brought into unison as a starting point, or zero, the other 37 keys including letters of the alphabet, figures, and a key for returning for new line. The space key is usually down when the current is on, to lock the pin cylinder from revolving. If any other key is pressed down, its lever arm, coming up under the pin cylinder, pushes back a horizontal bar latch and releases a lever then up and is itself in turn caught by the same latch and held until another key is pressed down. As soon as one lever is released and falls, the pin cylinder begins to revolve and continues until another pin on it comes against the end of the ascending lever. The revolving pin cylinder, by determining the number of impulses sent out, controls the rotation of the type wheel. The cylinder has geared to it a revolving commutator which reverses the current on the line. Each character key pressed down corresponds to a different number of impulses, and any motion in the pin cylinder of the transmitter is exactly duplicated by the type wheel shaft of the receiver.

The receiver has a type wheel with attached rotating power, an armature on the left, moved back and forth by magnets, releasing the type wheel shaft and allowing it to revolve step by step. The number of steps is determined by the number of impulses of current sent out by the transmitter. The paper is stationary, and the type wheel carriage moves horizontally from left to right, being checked at each step, that a small hammer may strike the paper against the character opposite it on the type wheel. When the carriage has been moved to the extreme right the operator depresses a key, when the carriage is drawn back and the paper is fed upward a short distance for a new line of printed matter. The instruments may be set up and primarily adjusted by any intelligent person, when they may afterward be operated by any typewriter, and without difficulty kept in operating adjustment.


LPOOL 12.41 PM-COTTON MODERATE -
DEMAND- 4 3-16- SALES 8000- RECEIPTS 1000-
AMN 10600-FUTURES QUIET-ABOUT UNCHAN
JULY-AUG 4 05 TO 4.04-OCT-NOV 3 49
-OUR CROPS-
CINCINNATI SPL-PRICE CURRENT SAYS CONDI
-ERABLE IMPROVEMENT

TRANSMITTER AND RECEIVER—NEW PRINTING TELEGRAPH.

Is Baldness Contagious?

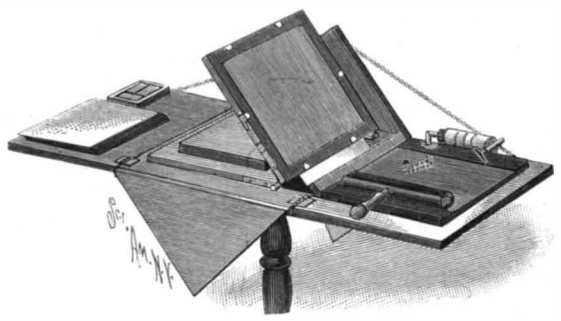
Dr. Sabouraud, in the Annales de Dermatologie, firmly believes that the disease is contagious, and that barbers' instruments are the most common carriers of the contagion; but as customers come and go from one barber to another, it is difficult to trace each case to its source. Starting with the theory of the microbic origin of the disease, Sabouraud has worked out a strong chain of evidence in its support. He tells us that the typical hair of Alopecia areata is found at the edge of an advancing patch, and is a stump of long hair that has remained in the scalp. It is club shaped, or like an interrogation point. Its diameter becomes less as we go toward the root, and its color is lost. These hairs are always a sign of an advancing patch, and are not found in old patches. The medullary (or pith) canal of these hairs is normal above, altered in the middle, and completely wanting at the root. The root is not bulbous and hollowed for the papilla, but in the form of a turnip. . . . Utricules that are full and closed are found among the sound hairs. They are filled with joined strata of epidermic cells, and contain in their centers, like a larva in a cocoon, compact clusters of microbes, a pure culture of the smallest bacillus known. . . . . As it grows old it may be one quarter millimeter (0·01 inch) wide and one-half to one millimeter long, and comma shaped, or bent. The young bacilli are a little swollen in the center, and their ends are blunt. . . . . Each utricule contains millions of them. . . . . This bacillus is regarded as the probable cause of the disease.

A Municipality Engages in Journalism.

Dresden owns a singular piece of property, says the Home Journal. It is a morning newspaper, the Dresdener Anzeiger. This daily paper, upon the death of its last proprietor, was willed to the city upon condition that all profits arising therefrom should be spent upon the public parks. This year a large playground of nearly eight acres was purchased from Prince George, the king's brother and heir apparent, and it will be ready for use next spring. The paper continues to hold the respect of all citizens, for the trust has been carried out in the broadest spirit, and the paper has never been employed to foster any school of opinions.

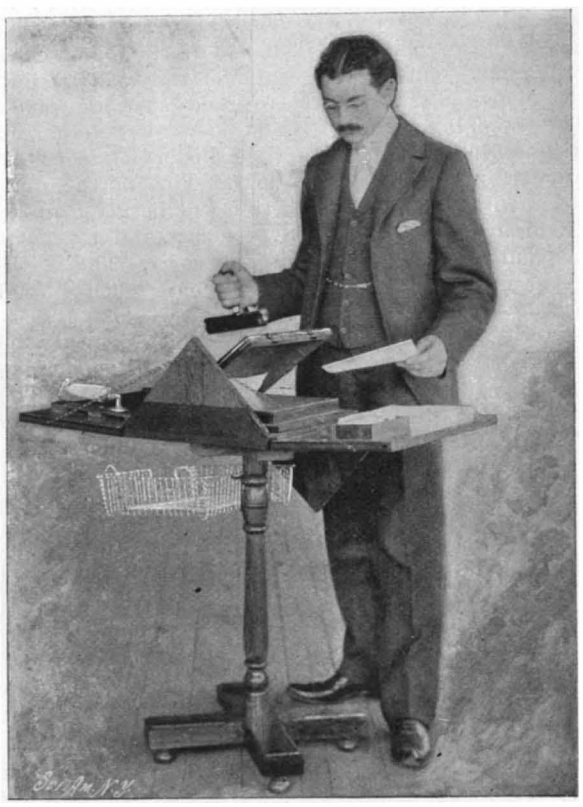
THE "NEOSTYLE."

The accompanying illustrations represent a simple, inexpensive, and convenient apparatus for duplicating letters, circulars, notices, reports, etc., written originally with the Neostyle pen, or with the typewriter on a sheet of patented stencil paper. It is manufactured by the Neostyle Company, Nos. 96–102 Church Street, New York. The typewriter stencil paper is a very porous Japanese paper rendered impervious to ink by coating it with wax. The impact of the type in the typewriter forces the wax out of the porous paper where the type strike, thus making a stencil of the sheet. A thin tissue protecting sheet is used to prevent the wax filling up the types, and a silk gauze sheet is used at the back to receive the wax forced from the sheet in making the stencil. This sheet differs from other stencil sheets inasmuch as no folding is necessary when putting it into the typewriter, and consequently no varnish is required to cover cracks caused by folding. The stencil sheet is cut the same size as an ordinary sheet of typewriter paper.



THE "NEOSTYLE" PRINTING APPARATUS.

To obtain any number of copies from the stencil, a sheet of patent porous paper, porous in the center and having a waxed border, is stretched in a printing frame. The stencil is then laid against this porous sheet, to which it adheres by capillary attraction, the sheet to be printed upon is placed upon a flat bed beneath the frame, and the latter is pressed down upon the paper, when the copy is made by passing an inking roller over the upper surface of the porous paper held in the frame, the ink penetrating where the stencil is made. The printing frame is spring hinged, and the suction as it rises causes the printed copy to partially lift and fall obliquely through a slot at the back of the frame into a basket, as shown in the larger view. A kind of soft printing ink is used, which readily penetrates into the paper and almost instantly dries. The stencil is removed by simply pulling it away from the porous sheet, and the same sheet of porous paper may be used for a number of different stencils. The work is a close imitation of actual typewriting, and copies may be taken at the rate of twenty a minute. Copies of electrotypes may be made by impressing them upon the stencil sheet, and music is duplicated by making the notes upon the stencil sheets with suitable punches, paper specially ruled therefor being provided.



MAKING COPIES ON THE "NEOSTYLE" PRINTING APPARATUS.

The ink supply is furnished from a collapsible tube mounted at one edge of the ink table, the nozzle of the tube being connected to a tube running under the ink slate to an opening formed in the surface, as shown by the dotted lines in the small view. Attached to the rear end of the collapsible tube is a key, by turning which the ink is forced out upon the slate as desired, the key

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winding the body of the tube around itself and eventually forcing all the ink out of the tube with but the slightest effort and without waste, and obviating all necessity of handling the ink tube. The machine is furnished with a small automatic indicator which registers the number of copies printed. The two side and central flaps are so arranged that when the machine is closed it forms a small triangular cabinet, which takes up about eighteen square inches of floor space and can be set in any corner of an office.

The Brooklyn Institute's New Home.

The new museum building of the Brooklyn Institute of Arts and Sciences was formally opened by a reception on Wednesday, June 2, and on June 3 the building was opened for the first time to members. The first exhibition of the institute is the choice loan collection of nearly six hundred paintings. The new building is located on the Eastern Parkway, a splendid boulevard. The new building measures 193 × 71 feet. It is only about one thirty-second of what the completed structure will be. In 1889 an act of the legislature secured a site and made the museum a possibility. The institute was incorporated in 1890, and plans for the building were made and the design accepted. The architects of the new building were Messrs. McKim, Mead & White, and the building is specially happy in its arrangement for museum purposes and for carrying on the educational work of the institute. The plan of the first or principal floor of the completed building will be as follows: Through the center axis of the building, and running north and south and connecting the two main entrances, is the great hall of sculpture divided at the center by the Memorial Hall, which occupies the center of the building. In the part north of Memorial Hall will be placed the best reproductions of ancient sculpture, and in the part south of Memorial Hall the best representatives of modern sculpture. Along the east and west axis of the building will be located at the east end the large auditorium for lectures, concerts, etc., and at the west end the great exhibition hall for loan collections. The auditorium and exhibition hall opening at the center of the building into the Memorial Hall, form a grand suite of rooms. The remaining parts of the first floor will be occupied with collections representing the history of architecture, sculpture and allied arts. The northeastern court, with the adjacent galleries, will be given up to Chaldæan, Assyrian and Egyptian art, and to American and Eastern prehistoric archæology. The northwestern court and the adjacent galleries will be devoted to Græco-Roman art. The southwestern court and adjacent galleries will be for mediæval art, including Byzantine, Romanesque and the different developments of Gothic art. The southeastern court and adjacent galleries will contain the history of modern art, including the different developments of the Renaissance, Mohammedan art, Chinese art, Japanese and recent art. The type rooms will be constructed in the four sections of the museum to illustrate each of the great art movements in ancient, mediæval and modern times. The four great courts will be covered with glass at the roof of the building and will contain the larger objects. The great auditorium and the large exhibition hall will each rise through the stories of the museum and have galleries on the second and third floors. The second floor will be occupied chiefly by the literary and scientific departments of the institute. Various lecture rooms will be provided as well as ample storage space for scientific apparatus. There will also be ample room for the various scientific collections, of which the institute has already a considerable number.

The third floor will be occupied by the music room, library, picture gallery and galleries for domestic art and science. The central part of the building will rise one story higher, and the other parts of the building will be occupied by the departments of engineering, electricity and chemistry, and will also contain schools of painting, sculpture, architecture and photography. The basement contains lecture rooms, offices, apparatus for heating, ventilating, etc.

The Memorial Hall will constitute the center and the crowning feature of the building, and will rise from the first floor to the arch of the central dome of the structure. It is designed to commemorate the lives of those who have been most distinguished in their service to the country, State and city. Of course, it will be many years before the splendid museum building will be completed in its entirety, but when the remarkable growth of the Metropolitan Museum of Art and the American Museum of Natural History is considered, it seems possible that the entire project can be carried out before a very long period of time has elapsed.

There is really no more reason why Greater New York should not have three museums devoted to arts and sciences than London, which has its three great museums. The feeling after visiting the great museums and galleries of London is that, if they should all be consolidated in one, the mass of material would be so great that a large part of its power to impart pleasure and instruction would be lost.

The Brooklyn Institute of Arts and Sciences occupied a building in Washington Street from 1835 to 1891, when the building was destroyed by fire. In 1888 the Institute began a new lease of life; instead of a fossil society it sprang at once into an educational power which is recognized all over the country. This renaissance was largely due to the enthusiasm of Prof. Franklin W. Hooper, whom Brooklyn may thank for the museum and wonderful growth of the Institute. On June 1, 1888, there were eighty-two members; on June 1, 1896, there were four thousand one hundred and sixty-eight members. The educational work of this organization is chiefly conducted by lectures, of which perhaps a dozen are given each season under the auspices of the Institute as a whole. The others are provided by the several departments, which are really independent societies, which may be compared to the States of the Union, the Institute standing in the place of the Federal government.

From October 1 to June 1 there are on an average five hundred lectures, to which admission is free to all members of the institute. There are in addition a large number of other lectures and special courses of lectures to which members contribute a part of the cost. These lectures are often given by people of national reputation, as Lieut. Peary, Prof. William H. Goodyear, Edward Everett Hale, John Fiske, John Burroughs, Miss Parloa, Dr. T. C. Mendenhall, Gen. Greely, E. J. Houston, Sir Archibald Geikie, Sir William Dawson, etc. There are many exhibitions held during the year, and a considerable amount of original work is conducted, as, for instance, the Brooklyn Institute Survey of Mediæval Italian Buildings, which enabled Prof. Goodyear to make his remarkable discoveries, which have already been referred to in these columns.

Polychromy in Greek Statuary.

M. Maxime Collignon, in the Revue des Deux Mondes, gives a very interesting paper upon polychromy in Greek statuary, of which the following is a brief abstract. In order to explain the use of polychromy in Greece, frequent reference is made to the influence of the climate, to the peculiarity of the intense light, which often blinds the sight, and which, on hot summer days, drowns, as it were, the shapes of things and their outlines. This argument has not lost its value; it has often been invoked, and we are still quite ready to acknowledge that a privileged sky evoked in the Greeks, as in the Egyptians and the Asiatics, an instinct and a necessity for color; but polychromy exists already in primitive Hellas long before art was sufficiently advanced to understand its laws and to analyze its harmony. At a time when statuary was represented by a few wooden statues, painting was a never-failing complement of these works. It serves to conceal shortcomings and gives to the work a semblance of life. Ancient writings allude more than once to such wooden images, which were produced and adorned with colors, even into the classic period. During the seventh century before our era, sculpture began to employ a material more durable than wood. If wooden statuary already required the use of colors, sculptures of soft stone exacted it likewise as an indispensable complement.

The sculptor who uses this pliable material that yields so readily to the chisel cannot reproduce all the details of the shapes that make up his model. His eye was shocked by the defect in the stone, by the rough and uneven aspect it presents. There was a call for painting here also, as it played its part to conceal the imperfections in the material, to beautify the work and to give to the statue its final, definite form. In such cases polychromy ought to be as complete as possible, and it is thus that the monument shows it to us. So we obtain a well established law for primitive Greek art, whether the work is a statue or a bass relief. Sculpture in soft stone requires complete coloring.

Marble is for us a rare and costly material. This no doubt was one of the reasons why the idea of polychromy was for a time looked upon as a kind of sacrilege. The use of the new material did not at once cause old habits to be abandoned. Polychromy has not disappeared. It was only somewhat changed. A safe instinct warned the sculptors that this close and highly polished grain, this warm transparency, this gentle glow, must all contribute to the beauty of artistic work; and the problem which they had to solve was to conciliate the exigencies of the material with those of color. This problem archaic masters were bent upon solving, and they did it with as much good taste as decisiveness.

The statues of women gathered together in the Museum of the Acropolis are well known. The minute carefulness of the execution warned us that the art of working in marble reached its highest technical perfection, so that any progress to be made thereafter could only be a progress in style. Polychromy now follows established rules and no longer proceeds by experiments. Dull, solid colors without transparency stand out from the marble which forms the ground. The tones which prevail in this scale of color are always the same as those used in monumental polychromy—that is to say, red and blue. A few fine black lines marked the details of the eyes and the arch of the eyebrows. Here and there on the pendants and frontlets gilding adds a metallic sheen.

The polychromy of statues was not an absolute, inflexible rule that rigorously bound all artists alike, but if not an absolute law, it was, at least, a custom to which the taste of antiquity submitted gracefully. We find at the very outset written evidence to overcome our doubts upon the matter. The principal texts which in any way allude to statues have long since been collected and commented upon, and they spread over a long period—from the fourth century of our era to a very advanced date in the times of the emperors.

As time went on the Greek sculptors emigrated to Italy, and to satisfy the demands of their Roman patrons they multiplied copies of celebrated statues, and it is interesting to inquire whether polychromy survived these new conditions and became acclimatized under the Italian sky. Instead of proscribing the union between sculpture and painting, the Italian taste eagerly accepted it. We do not find that it gives way to monochromatic sculpture. In the time of the emperors colored marble statues were produced which might be called "natural polychromy," which, if they do not secure our admiration, at least excite our curiosity. How could painting by the side of statuary art so daringly many-colored fail to maintain its rights, protected as they were by old tradition and by the prestige of Hellenic art? It maintained them so well that it is to Græco-Roman sculpture we owe very many and very conclusive specimens of colored statues. In Pompeii we find in frescoes reproductions of painted statues with a well sustained tint for the fleshy parts. Statues in gorgeous polychromy dating from the first year of our era have been found.

In 1885 the director of the Albertinum in Dresden organized in the Berlin National Gallery an exhibition of polychromatic statuary belonging to all countries and ages, from Egyptian statues in limestone to painted marble busts and figures by contemporary artists. Efforts have been made to restore some of the statues, in order to give them back a little of their old glory.

M. Collignon concludes by saying that Greek polychromy is above all conventional. At a later period, when art had progressed, far from claiming to have conquered, it knows how to respect the noble material which artists used for their purposes, to play a subordinate part to sculpture and to lend it very discreet assistance. Its part to play is not, as has been said, to "attempt an impossible fraud," but to enhance the charms of perfect form. For the same reason, it must always be a very delicate art, all in dainty tints, hostile to violent exaggerations and well able to resist the temptations of realistic art. Now, when we admire the marvels produced by industrial art in Greece, the delicate coloring of the little terra cotta figurines, we must highly honor the painters of the statues. We do not know exactly what a work may have been in which a Praxiteles and a Nicias combine their efforts, but we do know that it required all the exquisite taste and all the science of the great masters to realize in the Tanagra figurines the harmonious alliance of form and of color.

Electrical Engineers at Niagara.

The twentieth annual convention of the National Electric Light Association opened at Niagara Falls on June 8. There could not have been selected a better place for such a meeting, considering the progress already made in the utilizing of the water power of Niagara by the aid of electricity and the prospects of its greatly enlarged use in the near future. In addition to reports of committees and the discussion of subjects of special interest to electricians, the following papers were to be read before the convention: "Standardizing Prices for Incandescent Light and Power," by J. B. Cahoon. "Municipal Lighting," by W. Worth Bean. "Correct Method of Charging for Product," by C. L. Edgar. "The Niagara Power Transmission Line," by J. G. White. "Profitable Extensions of Electrical Supply Stations," by Arthur Wright. "The Induction Factor, a New Basis of Dynamo Calculation and Classification," by Prof. Charles A. Carus-Wilson. "Recent Progress in Arc Lighting," by Prof. Elihu Thomson. "The Daylight Work of Central Stations," by T. C. Martin. "Niagara Power," by L. B. Stillwell. "Polyphase Motors," by B. F. Lamme. "Frequency Transformation," by Lieut. F. Jarvis Patten. "Rotaries for Transforming Alternating into Direct Currents," by C. F. Scott.

Lord Kelvin on the Age of the Earth.

Lord Kelvin, in an address upon the earth as an abode fitted for life, has summed up the evidence into what must be accepted as the latest dictum of science regarding this obscure point. The old idea was of a solid earth nearly 20,000,000,000 years old, but modern science makes an immense reduction in this estimate. He was able to say with confidence that the earth solidified between 20,000,000 and 30,000,000 years ago. The latest estimate of the time required for the formation of all strata since the beginning of the Cambrian rocks is 17,000,000 years. Lord Kelvin declares that the earth could not have been habitable more than 30,000,000 years.

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RECENT INVESTIGATIONS OF X RAYS.

BY WILLIAM H. HALE, PH.D.

Prof. Arthur W. Wright, of Yale University, interested so many in his description of his investigation of experiments with X rays at the meeting of the National Academy of Science, last May, that a more lengthy account of what has lately been ascertained will doubtless be of interest. A recent visit to his laboratory at New Haven, Conn., found him busy experimenting on the X ray work. He showed me all the results of his recent work at the Sloane Laboratory.

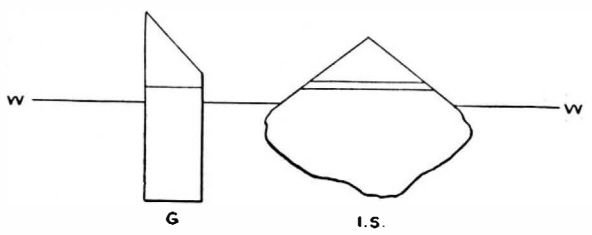
To determine the nature of the X rays has, from the beginning, been a great problem for all investigators, and it still perplexes and baffles all. Are they, in reality, light-rays or rays analogous to light, but of much shorter wave length, or are they projected matter? Both theories have advocates. Prof. Ogden N. Rood thinks that he has demonstrated the fact that they can be reflected to some extent, like rays of light. If every precaution is taken to remove the possibility of error in these experiments, they might not furnish a crucial test for either theory.

The only respects in which the X rays are thus far known to resemble rays of light are in producing fluorescence, and in blackening sensitized plates—photographic action. Tesla and some others, therefore, still maintain that they consist of projected matter.

Obviously, if refraction or polarization can be detected, it would show an analogy to rays of light. Prof. Wright has, therefore, performed experiments to ascertain, if possible, whether these phenomena occur, but with only negative results thus far.

His first care was to eliminate the source of error due to the use of prisms to determine refraction. The thick part of a prism absorbs more rays than the edge. This gives rise to an appearance as if the rays were bent toward the edge of the prism, an action directly opposite to refraction.

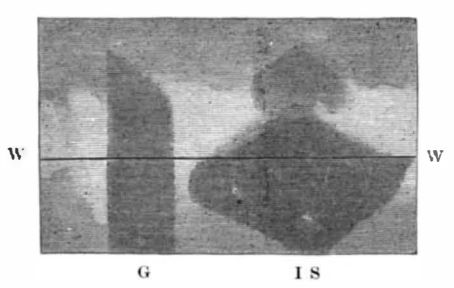
To obviate this a piece of plain glass was used, placed so that rays would strike it at an angle of about 45°. As a test for polarization, a crystal of Iceland spar was placed beside it. A platinum wire was then stretched across the glass and the crystal. Rays of light passing through the apparatus are deflected both by the glass and by the spar; they are also split by the spar so as to produce a double image of the wire. The effect of this refraction and double refraction is such that the straight wire appears, when observed through this apparatus at the angle of 45°, to be broken and moved out of place by the glass and the spar, and to be also doubled by the spar, as shown in the following diagram:



G, glass; I S, Iceland spar; W. wire.

Fig. 1.

The picture taken by X rays, however, is shown in Fig. 2.



G, glass; I S, Iceland spar; W, wire.

Fig. 2.

In this case it will be noted that the wire is shown straight and no trace of refraction or of double refraction can be detected. The glass used was about eight millimeters thick, and the distance traversed by rays going through it at the angle of 45° was about one centimeter. The Iceland spar was one centimeter in thickness, making the path of the rays a little over twelve millimeters.

The displacement of rays of light by the glass was 1·4 mm., and by the spar 1·0 and 1·8 mm., compared with 0 by the X rays.

A further test was made by placing a crystal of Iceland spar about an inch thick over a fine wire grating. The picture taken by X rays showed no trace of refraction or polarization.

A very unexpected result, however, and one which may prove to be of much importance, was obtained in certain other pictures of platinum wires. The wire used was hardly as thick as a pin. The picture of the wire appeared as a bright line in the negative, because the wire is opaque to X rays. Examination of the negative with a microscope, however, discloses a very faint dark line running through the image of the wire, which exactly corresponds with the bright interference lines caused by diffraction of rays of light, as shown in the following much magnified picture:

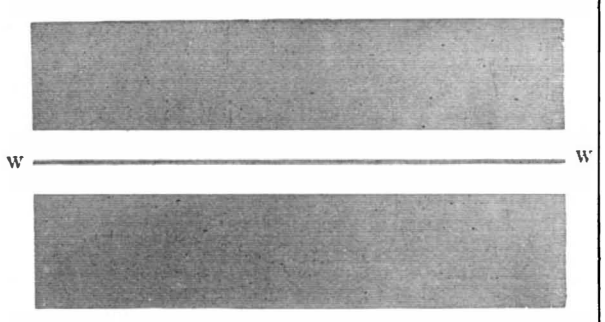
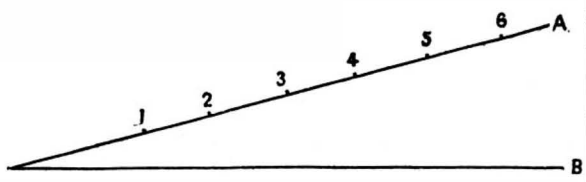


Fig. 3.—MAGNIFIED IMAGE OF PLATINUM WIRE.

Prof. Wright calls attention to the fact that this phenomenon may either be due to diffraction or to the deflection of streams of radiant matter, as when a sand blast is directed against a rod, part of the sand is bent inward.

Prof. Wright is now investigating this subject, and among his last experiments, since his return from Washington, he has taken pictures of a series of wires so arranged upon a plate as to occupy successively increasing distances from the photographic plate on which their image was cast, and he finds that this faint inner line is not observable at very short distance from the wire, but becomes apparent when there is an interval of two or three inches between the wire and the plate. The following diagram shows about the angle at which the plate holding the wires and the photographic plate were placed, the apparatus being viewed from above.



A, plate holding wires, 1, 2, 3, 4, 5, 6; B, photographic plate.

Fig. 4.

Fig. 5 is the picture thus obtained, the wires being magnified for distinctness.

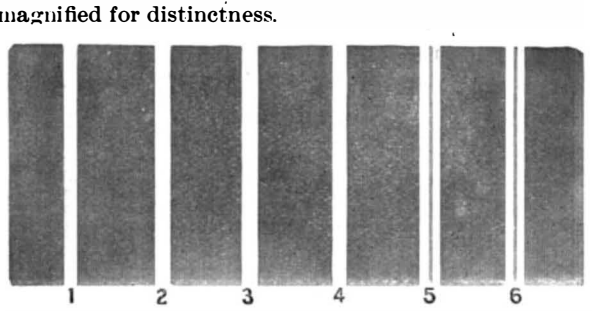


Fig. 5.—MAGNIFIED PHOTOGRAPH OF THE WIRES.

The supposed diffraction line is not seen at all in wires 1, 2, 3, and 4; is very faint in 5 and is most distinct in No. 6, being the wire most distant from the photographic plate.

Meantime, while conducting these abstruse investigations, Prof. Wright has obtained some results of a very practical nature. Experiments were made with eight gallstones, the largest being about the size of a hazel nut. They were wrapped in rubber, and inclosed in the center of a piece of beef about three inches thick. The X ray picture showed them all, but with different degrees of distinctness. In a subsequent picture the rays were passed through Prof. Wright's arm also, and the gallstones could still be made out, though very faint where the bone of the arm had been interposed.

The importance of this application of X rays to surgery is obvious; and it is of special interest, because the stones are not calcareous, but of the nature and density of hardened wax, and hence it might have been supposed that they would be transparent to the X rays. Prof. Wright informs me, however, that all were from the same person; and with the usual caution of scientists, he reserves decision of the question whether gallstones from other persons would give the same result; suggesting the possibility that those employed in the experiment may have contained traces of calcareous matter which would render them less transparent to X rays than some others might prove to be.

The publicity given to this result, however, will doubtless incite other investigators to further investigations, and this point may, therefore, soon be settled.

BY enactment of Congress, the topographic as well as the geological maps and atlases of the United States Geological Survey may now be purchased by the public. They are now sold at a merely nominal price. In quantities, they may be purchased for two cents each. Lists of the maps may be had on application to the director of the survey.

Science Notes.

W. N. Hartley and H. Ramage have recently examined a large number of ores and minerals by means of spectrographic analysis, says the Mining and Scientific Press. Most notable is the wide distribution of gallium, which was found in 68 out of 168 specimens, occurring in most magnetites, bauxites and blendes, and nearly half the clay ironstones and manganese ores. Rubidium appears to be even more widely distributed, occurring in most iron ores. Indium was found in thirty minerals, including all the carbonates of iron and tin ores and most blendes. Thallium, while less widespread, was frequently found. Iron and sodium were found in every specimen, and potassium in all but two, one a blende and the other a tin ore. Calcium, copper and silver were found in all but a few cases. Such a wide dissemination of gallium and indium is unexpected, and the same might be said of silver. Among metals not looked for by the authors, titanium is known to be found almost universally, and possibly the same is true of gold.

The bill providing for taking the twelfth census and the establishment of a permanent census service was reported favorably on May 10. This bill was drawn up by the Hon. Carroll D. Wright in accordance with the joint resolution of Congress. The bill provides for a permanent census office at Washington, the duties of which will be the taking of the twelfth and each succeeding decennial census and the collection of other statistical information in intervening years. The director of the census and assistant director are to be appointees of the President, but the assistant director must be an experienced, practical statistician. It is estimated that the annual cost of the permanent census bureau will be less than $500,000 per annum, and that the decennial enumeration with the tabulation of results will cost three or four million dollars more; so that the permanent census bureau would cost far less than the eleventh census, which cost some eleven and one-half million dollars. Various items are to be omitted from the decennial census and considerable work is to be relegated to other bureaus. Certain classes of statistics are to be published annually.

Mr. H. M. Richards, who has previously studied the effect of wounds on plant respiration, now describes (Annals of Botany, xi, 29) a course of experiments on the evolution of heat by wounded plants. He finds, says Natural Science, that accompanying the increased rate of respiration is an increase in the temperature of the parts affected. A kind of fever supervenes, and as in the case of respiration, the disturbance runs a definite course, and attains its maximum some twenty-four hours after injury. It is interesting to note that the attempt to rally from an injury is accompanied by somewhat the same symptoms, increased rate of respiration and evolution of heat, in plants as in animals. Owing to the nature of the case, the reaction is less obvious in the former than in the latter, and a delicate thermo-electric element was required to appreciate the rise in temperature; but, compared with the ordinary temperature of plants in relation to the surrounding medium, the rise after injury is "as great, if not greater, than in animals." The maximum in all the plants investigated was between two and three times the ordinary excess above the surrounding air. Potatoes proved the most satisfactory objects for experiment, and it was found that in massive tissues (such as potatoes or radishes afford) the effect of injury was local, whereas in the case of leaves (e. g., onion bulbs) a much greater extent of tissue was sympathetically affected.

The Royal Society recently gave its annual conversazione. It was attended by Lord Lister, the Earl of Rosse, Lord Kelvin, Sir John Lubbock, Prof. S. P. Thompson, Prof. Roberts-Austen, Dr. Ludwig Mond and many others. The exhibition of scientific apparatus included a few excellent novelties, among which were some illustrations of the Dansac-Chassagne process of producing photographs in color. Mr. F. C. Atkinson exhibited an indicator made to register the power exerted by an oarsman. An ordinary indicator diagram is recorded on a strip of paper on the drum by a pencil rotating with the oar and moving vertically as the pressure of the oar compresses the spring. During the "swing forward," after a stroke has been recorded, automatic gear winds the diagram strip into a new position, while other gear permits of obtaining a diagram, if desired, of only every fifth stroke. With this instrument details, both as regards style and horse power, can be secured of a course of five hundred strokes. Mr. Wimshurst exhibited the largest electrical influence machine in the world. It is to go shortly to the Victorian Exhibition at Earl's Court. Between the terminals it gives a spark of thirty-four inches. This machine is about three times as powerful as that made by Mr. Wimshurst for the Crystal Palace Exhibition. Prof. Roberts-Austen showed the microphotographic camera as used by him for producing the pictures of the sections of alloys. Prof. Oliver Lodge showed a very delicate demonstration of Zeeman's discovery of the broadening of spectrum lines by the action of a magnetic field on the source of light. Prof. Silvanus Thompson and others showed interesting experiments.

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A REMARKABLE DOUBLE TREE.

The SCIENTIFIC AMERICAN of December 8, 1894, contained an interesting picture of a double elm. The accompanying cut of a double ash is from a photograph taken by Prof. William Werthner, of the Dayton High School. The tree stands near Waynesville, O. It is a very symmetrical coalescence of two blue ash trees, 5 feet apart at the ground and at 15 feet above joining to form a perfect trunk that extends to a height of some 70 feet. Each tree is from 15 to 18 inches in diameter, and each trunk, as well as the upper bole, is perfectly normal, nor does the fork show any signs of a flattening, ridge or one-sided coalescence. Hence, the union must have taken place when the trees were saplings.

Is this a "natural graft," or did some Indian possibly use the saplings as part of his wigwam support and tie them so tightly as to induce a coalescence? The size of the trees (considering the slow rate of growth of the blue ash) seems to make them antedate the white settlers in Ohio.

A. F. FOERSTE.

DOUBLE ASH NEAR WAYNESVILLE, OHIO.
Photo. by Wm. Werthner, Dayton, O.

PULPIT IN THE CASTLE CHAPEL AT ASCHAFFENBURG.

The accompanying engraving is reproduced from the Building Edition of the SCIENTIFIC AMERICAN for September, 1896, in which some account of Aschaffenburg, a town in Lower Franconia, Bavaria, where the subject of the illustration is to be found, is given. The history of Aschaffenburg goes back to Roman times, and it has long been noted for its educational establishments. The Pompeianum, a villa erected by King Louis of Bavaria in 1824-49, in imitation of the house of Castor and Pollux at Pompeii, is one of the sights of the town, as is also Abbey Church, which contains fine monuments. The schloss, or castle, with its four lofty towers, each 191 feet high, was erected in 1605-14. The pulpit was built in 1630 from designs by Georg Riedinger, of Strasburg. The name of the builder is unknown. The design of the pulpit is good, considering its date, for it was made in the midst of the Rococo period. The combination of conventional ornament with figures in the round and bass-relief has not usually been as successful except in the hands of a few of the best Italian sculptors.

The original engraving of this handsome piece of work appeared in Blätter für Architectur und Kunsthandwerk.

A PULPIT AT ASCHAFFENBURG BAVARIA.

The Gagnon Electric Railroad at Butte, Montana.

At the recent annual meeting of the Montana Society of Civil Engineers, President Herron described the Gagnon Electric Railroad, which the Colorado Smelting and Mining Company, of Butte, has the past year built to avoid the wagon hauls of its ores from the mine to the smelter.

This interesting work has a total length of 2·7 miles, says the Engineering and Mining Journal. At the Gagnon terminal is a tunnel 254 feet long through the waste dumps. This tunnel is on a 70° curve, and has a grade of 3 per cent. At the reduction plant terminal the concentrator bins are approached on a trestle with a grade of 2 per cent and a 65° curve. The maximum grade for loaded cars going out of the tunnel is 3 per cent. Empty cars returning up Montana Street have a maximum grade of 10·62 per cent. This grade is from Park Street to the mouth of the tunnel, and is operated by an electric hoist plant of two 15 H. P. Sprague double reduction motors established at the mouth of the tunnel. A cable is attached to the cars at the tunnel, which is the summit of the 10·62 per cent grade, and the cars are then let down as far as Park Street. At this point the cable is detached and the cars then proceed to the reduction plant under control of the trolley and brakes, having then a maximum down grade of 7·46 per cent.

The cars are of 10 tons capacity and are operated two together. Each is supplied with two 15 H. P. motors, and power is furnished from the city electric plant. Track and wheel brakes are on each car, but the wheel brakes are ordinarily sufficient to control them, the track brake being used only in emergencies. The electric hoist will also probably be done away with, as the combination of the two brakes is found to be efficient, even on the 10·62 per cent grade. The road is owned by the Butte Consolidated Street Railway Company, the ore being hauled by them under contract with the Colorado Company. Mr. F. W. Blackford had charge of the construction of the line.

A Long Distance Trial of the Torpedo Boat Porter.

Following closely upon the performance of the torpedo boat Porter on June 6, when she made a record of 42 miles in 1 hour and 50 minutes, comes the announcement that she has recently made the run around Long Island in 12 hours and 35 minutes. As the total distance is about 300 miles, she must have averaged from 23 to 25 miles an hour continuously for half a day. The little vessel left her moorings at the foot of Twenty-third Street at six o'clock in the morning, and the inspecting board was landed at Brooklyn at 6:35 P. M. the same day. The excellence of the workmanship on the engines is shown by the fact that they ran continuously at this high rate of speed without any mishap or heating of the journals. The highest speed for any one hour of the run was 27 knots, which is about a knot and a quarter less than the highest speed attained on her first trial trip.

While upon the subject of high speed vessels, it is interesting to note that the Ellide, a pleasure yacht which has been built from the designs of Mr. Charles D. Mosher, has made a speed of 33½ miles an hour during a preliminary trial trip on the Hudson River. The Ellide is about 80 feet over all, with a beam of 8 feet and a draught of 4 feet. Steam is supplied by a Mosher water tube boiler, and she is driven by quadruple expansion engines of 800 horse power. The boiler was not carrying a full head of steam, and it is expected that when the official trial takes place, the Ellide will prove to be the fastest vessel of any kind in American waters, if not in the world.

Production of American Cheese.

A recent report of the United States Department of Agriculture shows that nine-tenths of the cheese produced in this country comes from the States of New York, Wisconsin, Ohio, Illinois, Vermont, Iowa, Pennsylvania, and Michigan, in the order of their importance. The State of New York turns out half the total product, and the production of this State and that of Wisconsin represents more than two-thirds of the total. The cheese made annually in the United States necessitates the use of milk from about 1,000,000 cows, and its value varies between $20,000,000 and $25,000,000. In spite of the importance of the home production, the United States imports annually about 9,000,000 pounds of foreign cheese. The annual rate of consumption, which shows a slight tendency to decrease, is actually about 3 pounds of cheese per head of the population. The production amounted to 105,000,000 pounds in 1849; 103,000,000 in 1859; 162,000,000 in 1869; 243,000,000 in 1879, and 256,000,000 in 1889. The exports amounted to 81,000,000 pounds in 1893, 74,000,000 in 1894, and 60,000,000 in 1895.

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THE ANCIENT CITY OF NEW AMSTERDAM.

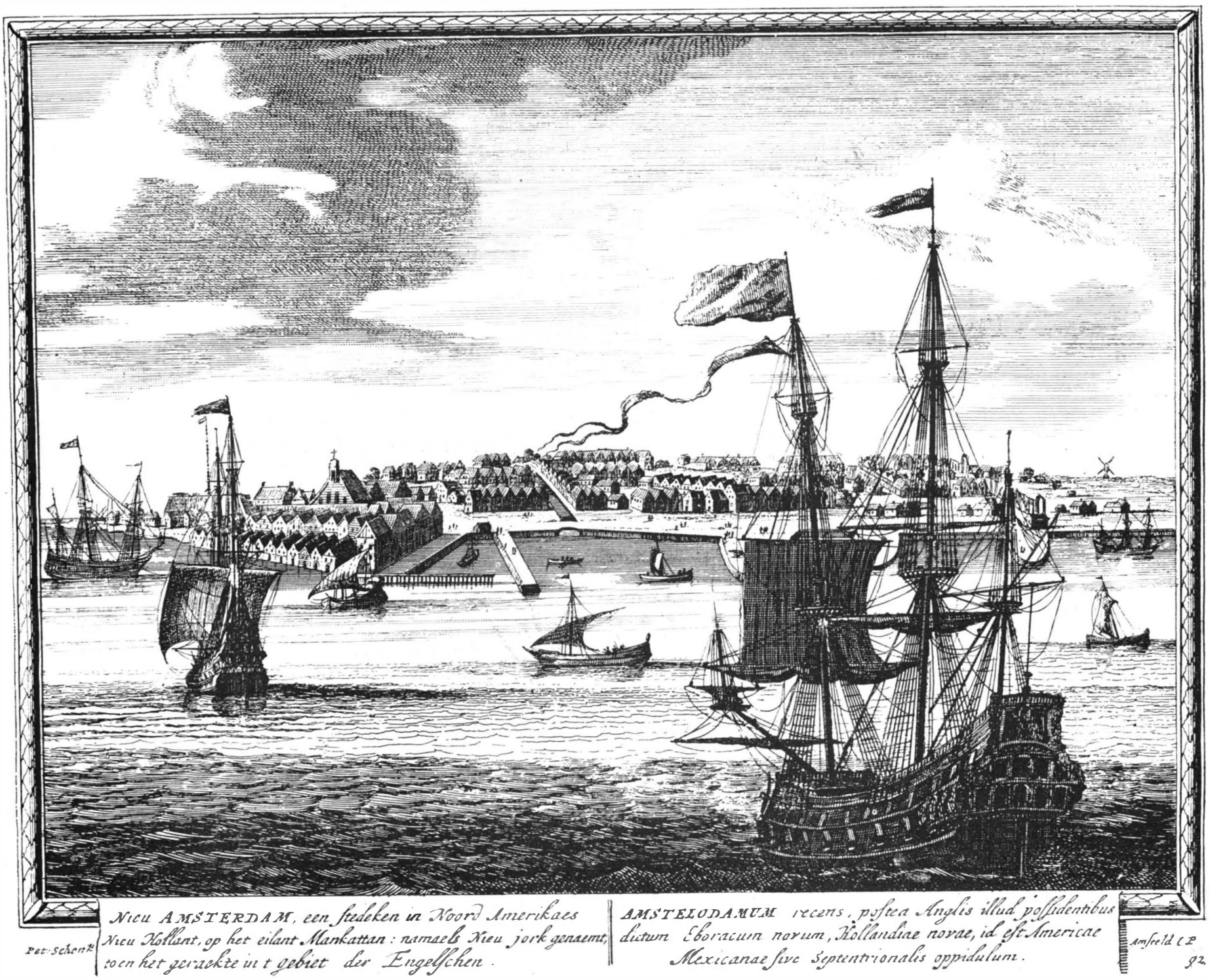
We have published from time to time accounts of the extremely high buildings which are being erected in the more crowded parts of the city of New York, particularly along Wall Street and lower Broadway. Few, even of the old residents of New York, appreciate the extent to which the city is being rebuilt. This work of reconstruction is being carried on to such an extent that few of the very old buildings remain, and New York always presents the appearance of a distinctly modern city. It is difficult for us to appreciate, therefore, that New York is nearly three hundred years old, and that it is described in the Dongon Charter as early as the year 1683 as an "ancient city and borough." This charter is curious reading, owing to the provision that is made by the English governor toward preserving the customs and protecting the rights of the Dutch inhabitants. The laws and regulations governing the killing of large and small game on the island and the regulations as regards the fishing rights are very interesting. Although New York was described at that time as an ancient city, it was by no means a large one, although it held a conspicuous place in the eyes of the world, owing to its political and commercial importance, and the part it was expected to play in the development of the new world. Its prominence is indicated by the number of early prints which exist, which clearly show the course of its growth and development.

The earliest known view of New York appears in a little Dutch book called the "Beschrijvinghe van Virginia," published in Amsterdam in 1651.

The island is represented as covered at the northern end by a thick wood, with a primitive fort at the southern extremity of the island, on the present site of the Battery. A few scattered dwellings, some of them substantial in appearance, surrounded the fort. A war canoe appears in the foreground, floating on the placid surface of the Hudson, in peaceful contrast with the warlike appearance of the Indians who form the crew. This little work is very rare, and is greatly sought after by collectors of Americana. Like many other rare works, its insignificant appearance doubtless is the principal cause of the disappearance of the work and its present rarity.

Another very early view appears in Montanus' Travels in America. This view represents a town of considerable importance; the fort has grown into a formidable affair and a lofty gallows occupies a prominent place in the foreground. The city has grown with considerable rapidity under the fostering care of the Dutch West India Company, which early perceived in the development of the trading post of New Amsterdam an opportunity of extending its commercial enterprises and of acquiring a firm hold in the new world. The view which is reproduced in the accompanying engraving, which is in size an exact facsimile of the original, is a little later than the Montanus view. The date ascribed to this view is 1667. It represents a thriving, prosperous town distinctly of the Dutch type, and the artist intended to convey some idea of its commercial importance by introducing into the scene a number of important merchant vessels and a frigate. The view was probably taken from Brooklyn Heights, some little distance below the present East River Bridge. At the extreme left may be seen the fort, which always occupies a conspicuous place, and quite properly, in all the early views of Manhattan. Within its walls and palisades was the gubernatorial residence, the barracks for the troops and the royal chapel, which formed an imposing feature of the landscape. Thither citizens repaired in case of disturbance. A canal or dike extended along the present site of Broad Street and is clearly shown in the view. The houses extended down to the water's edge, but it is difficult to trace the present outline of the shore, owing to the extent to which the island has been filled in and broadened at this point, two or three streets having been added on each side of the island, along the shores of the Hudson and the East Rivers. At the right of the picture may be seen the palisades, which were erected along the line of Wall Street, intended as a defense against the hostile natives, and more particularly the hated English, who were expected to make an inroad from New England. For this interesting and rare view we are indebted to Peter Schenk, whose name will be found engraved in the left hand corner.

The original engraving from which this reproduction was made was purchased in England several years ago by a collector of Americana residing in New York.


Nieu AMSTERDAM, een stedeken in Noord Amerikaes
Nieu Hollant, op het eilant Mankattan: namaels Nieu jork genaemt,
toen het geraekte in t gebiet der Engelschen.
AMSTELODAMUM recens, postea Anglis illud possidentibus
dictum Eboracum novum, Hollandiae novae, id est Americae
Mexicanae sive Septentrionalis oppidulum.
Pet. Schenk
Amsfeld ex
92.

THE CITY OF NEW AMSTERDAM AS IT APPEARED ABOUT 1667.

Oiling Ships' Hulls.

Experiments are to be made to determine the value of an invention by Rudolph Altschul, designed to increase the speed of vessels and to prevent corrosion and the growth of barnacles by coating the submerged portion of the ship with crude petroleum, says the Army and Navy Journal. The system is so arranged that in rough weather a large quantity of oil can be discharged along the sides of the ship and distributed over the surface of the water, thus providing a more effective method of greasing and smoothing high seas than any yet devised. The covering composition is an oleaginous preparation of tallow, calcined carbon and several other ingredients which the inventor keeps secret. It is said that it hardens in the water and cannot wash off, and can be applied to submarine war projectiles, permitting double velocity. A series of iron flanges are fastened along the bottom and sides of the ship below the water line, in which are inserted sheets of woven wire netting, lathing or sheet iron, covered with an absorbent composition saturated with oil. The flanges have a semicircular covering on top, below which runs a finely perforated pipe, which ejects a fine spray of oil against the inside of the flange and on to the sheets, from which it spreads downward. The oil is not carried away by the water, but through capillary attraction is spread, thus keeping the ship's hull greased without any waste of oil. It is said that the composition is a perfect carrier of oil under the surface of the water, a feature which has never before been achieved and which will make oil perform below the water line the same service that it does in quelling a rough sea. It is claimed that, applied to any vessel, either steam or sailing, it will increase the speed by at least 25 per cent without augmenting the amount of machinery or the expenditure of fuel.

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A LARGE WHALE ON A CALIFORNIA BEACH.

The male mammal shown in our illustration came ashore at Long Beach, Cal., on Thursday afternoon, May 13, tail first, and was made fast to a stake by a rope tied around the body next to the flukes. It gradually settled in the sand as the tide receded, as shown in the picture. It had apparently been injured, perhaps by a sword fish, as blood oozed from under it. It had spouted a few times when the tide was up, and lived until some time on Friday, opening its jaws several times. On Saturday and Sunday thousands of people from the country around, and from Los Angeles, 25 miles away, came to see the sight. The citizens raised a purse, and W. E. Haskins, a taxidermist, was engaged to prepare the skeleton for mounting in the Long Beach Park. The captors, M. A. Cook, Will Settles, and Frank Bowers, workmen on the bluff close by, received $150 for their prize, and George E. Blount, section foreman on the terminal railroad, gave the following as its measurements: Extreme length, 63·7 feet; length of jaw, 14½ feet; breadth of tail at points, 12 feet; breadth across back, 12·3 feet; length of fin, 6·7 feet. It was a black whale, having a dorsal fin. The skin was about two inches thick, and but a very small quantity of oil blubber was found. Our view is from a photograph taken by C. J. Dougherty, and for the foregoing particulars we are indebted to William Galer, of Long Beach, Cal.

Incandescent Light and Sight.

Some interesting discussion has taken place of late in regard to the effect upon the eye of the Auer incandescent light, says the London Lancet. The mantle of this incandescent system of lighting consists, as is now pretty generally known, of a network of the rare oxides (chiefly of thorium, with a small proportion of cerium), which on being heated in the Bunsen flame emits a brilliant white light. As might be expected, this light is comparatively rich in the ultra-violet or chemically active rays that are identical with those in sunlight, and it has been urged that this richness in actinic rays may possibly be productive of injury to the sight. This argument appears to be based on measurements of wave lengths made by means of the spectroscope.

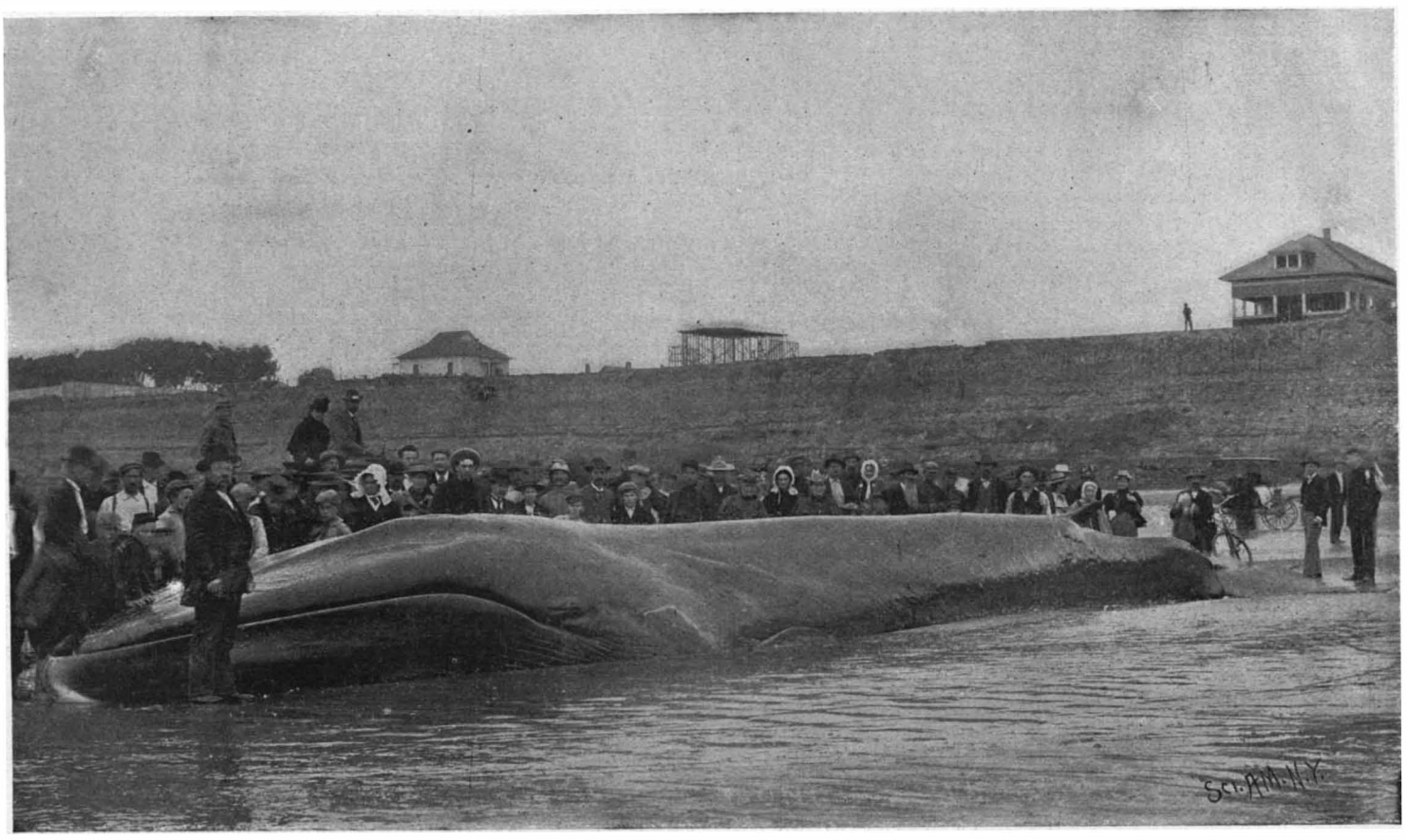
The arc electric light, it is said, has similar effects, but of a more pronounced character. As yet there is no evidence of experience, as far as we know—and the Welsbach light has now been in use for several years—that the slightest injury to the optic mechanism where the system has been in use for domestic lighting has ever been produced; and unless a person deliberately stared at the naked light for some hours every day it would be surprising to learn that real injury could be referred to this cause. It is well known that the radiation of light downward from the incandescent mantle is feeble, so that without a reflector or some reflecting surface at the top of the mantle, as in the ordinary way would be provided by a ceiling, much of the illuminating power would be lost. From the particular point of view under discussion this is, however, an advantage for the lighting of rooms, since reflected and not directly transmitted light is pleasanter and more agreeable to the eye, besides which in the phenomenon of reflection partial absorption takes place, so that the light becomes pleasantly diffused and of a healthy tone.

In any case, if any apprehension should exist that the rays proceeding from an incandescing mantle are injurious because of their chemical activity—an activity which in sunlight gives life to the plant world—these rays could be readily and effectually filtered out by the simple expedient of surrounding the light with a tinted globe, such as red or orange, which need reduce but very little the originally high illuminating power. Even then the light is over 100 per cent higher in illuminating value than the ordinary gas flame. Artificial light, of course, is most in request in the dark days of winter, and in that season, at the best of times, we receive but little more than eight hours' light from the sun, and then frequently it is largely filtered from its chemically active rays by the medium of a murky atmosphere.

On the other hand, we enjoy in the summer just twice as much sunlight, which is then of greatly increased power, and the chemical activity of which is infinitely greater than could possibly be furnished by any known form of artificial light. Taking these simple facts into consideration, we should almost expect to find in some form or other some manifestation of deterioration in the eyesight during the summer period, due to a largely increased exposure to the chemically active rays of solar light. We are not aware that any such manifestation has been observed. The argument that nature intended us to rest from the effects of light as soon as the sun is below the horizon demands, if it can be reasonably applied at all, the rejection of all artificial means of lighting, since there can be no light of any kind of any aid to the eye whatever that can be without some chemical activity.

Still less practicable does such a suggestion become when applied to the lands of the midnight sun and other places, or to the Arctic winter of several months' darkness. Clearly this theory could only be prompted by the consideration of the limited conditions of environment in the temperate zone. No men probably are exposed more freely and continuously to the chemically active rays of the sun than our sailors, yet their acuteness of vision and penetrative power of sight is a matter of admiration and wonder to every one. Sunlight is by a thousand circumstances widely and uniformly diffused, making it more acceptable to the eye, and during its journey to earth it undergoes an important modification, for in passing through the air it is deprived of some of the red rays, while the blue rays pass on—a circumstance which explains the azure character of the sky.

In view of these facts, it is difficult to receive the theory with any seriousness that because there may be a certain proportion of ultra-violet rays in a given artificial light it is necessarily injurious. It would be a sorry thing if these same rays were forever filtered out of the light of the sun by the medium of constant fog or cloud, as so often happens in the days of winter. Exposure to a purely elementary light, as red, yellow, or blue, does undoubtedly prove injurious either positively or negatively. The distress produced on working for some time, to quote one instance, in a red or yellow light, as in the dark room of the photographer, who employs one or other of these colors on account of their chemical inertness, is well known. Absence of sunlight is held to be synonymous with the absence of life, and the life-giving and invigorating qualities of solar light are largely, if not entirely, dependent upon the chemically active rays, and certain lines of scientific research have shown that without the phenomenon of insolation going on day by day life would be unendurable and finally extinguished. White light, therefore, as afforded in its entirety by the sun, is a necessity of existence.



LIVE WHALE CAPTURED AT LONG BEACH, CAL., MAY 13—LENGTH 63 FEET.

The German Population.

After a delay of three months the German Imperial Census Department has given us the exact results of the census taken in December, 1895. The Chronicle Berlin correspondent says the total population of the empire, including Alsace and Lorraine, reaches 52,244,503, against 49,428,470 in 1890 and 41,058,792 in 1871. That is to say, the population has increased 27 per cent since the re-establishment of the empire twenty-five years ago. The kingdom of Saxony in this period has increased 49½ per cent, Prussia 29 per cent, Hesse 21 per cent, Saxe-Coburg and Gotha 24 per cent. Remarkable increases are to be noted in the populations of the two free towns and their dependencies. Hamburg, which in 1871 had a population of 338,974, has now 681,632, and Bremen has risen from 122,402 to 196,278. A remarkable increase is also noticeable in some of the smaller states, where iron and coal industries have been recently developed—for instance, in the two Reuss principalities from 134,126 to 198,928. The increase in Bavaria is 19 per cent in the twenty-five years, in Würtemberg only 14, and in the Reichsland (Alsace and Lorraine) only 6. In the Prussian provinces the most marked increase of population is to be found in Westphalia, which has now 2,760,250, against 1,775,175 in 1871. The Rhine provinces show an increase of 42 per cent—from 3,579,347 in 1871 to 5,105,962 in 1895. The extraordinary increase in the population of Berlin and its suburbs is worth noting. In 1871 the Stadtkreis Berlin numbered 826,341 inhabitants; in 1891 it had risen to 1,677,351.

The Baltic Canal in the Winter.

In order to obviate the freezing up of the Baltic canal, thus keeping it open for navigation as long as possible, the authorities tried to replace the fresh water of the canal by salt water. This could only be done from the Bay of Kiel, where the water contains on an average one and one-half or one and three-quarters per cent of salt, while at the other end of the canal, in the Lower Elbe, the percentage is about one-half per cent only, and the level there is far more affected by the tidal movement than in the Bay of Kiel. By leaving open a sluice near Brunsbuttel during low tide, the salt water, entering from the Baltic end, was caused to gradually expel the fresh water through the other end of the canal, and at the present moment both in the canal itself and in the lakes through which it flows the fresh water fauna and flora are more and more disappearing and are being superseded by salt water plants and animals from the Baltic. The fish which used to populate the lakes will die as soon as they enter the canal.—Die Vedette.

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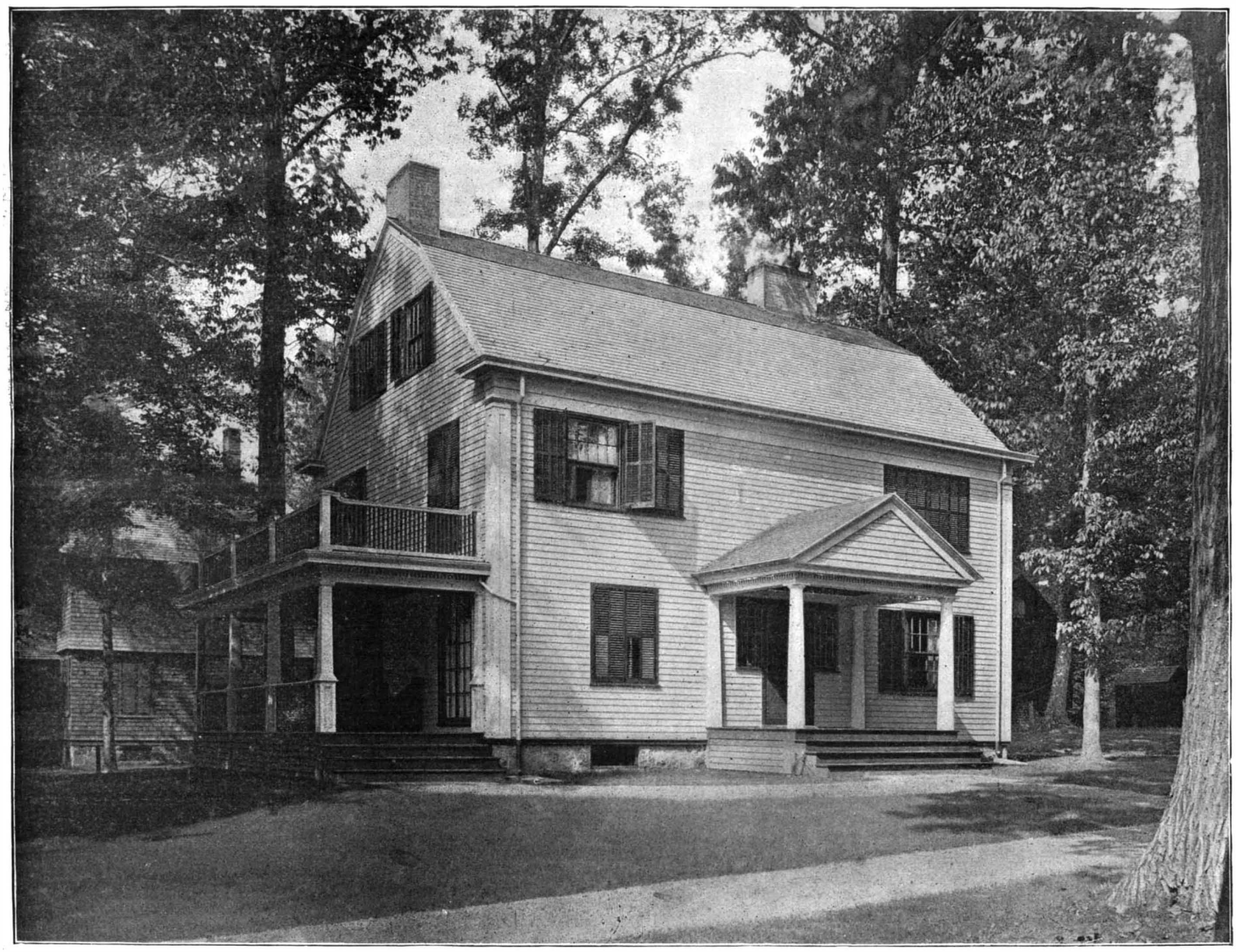
A COTTAGE AT NUTLEY, N. J.

We present an engraving of a cottage at Nutley, N. J., which was built from the plans of Mr. E. R. Silton, of New York. Our illustration is taken from our new work, "Inexpensive Country Homes." This book will be published this week. It comprises more than forty designs of houses reproduced by half tone process from photographs of the completed dwellings, our present engraving being a good example. The houses which have been selected to be embodied in this work cost from $1,000 to $5,000. Our readers are referred to our advertising columns for further information regarding this work.

The estimated cost of the cottage at Nutley is $4,000. It is pleasantly situated, surrounded by trees, and stands in the center of a well graded lawn. As in most country houses, a deep and wide piazza is provided, with a balcony on the second floor. The cottage is built of clapboards, upon a stone foundation. There are pilasters at each angle of the exterior, the trimmings are of red brick and the roof is shingle. On the ground floor the hall is in the center of the house, running through to the pantry in the rear. On the front are the library and parlor, access to the piazza being gained by windows which reach to the floor. At the rear of the house are dining room, pantry, kitchen and laundry, with a special porch for the use of tradesmen and servants. There are three bed rooms, one dressing room and a bath room on the second floor.



A COTTAGE AT NUTLEY, N. J.

Sitting Down.

It would seem at a glance that there is nothing profitable to be said about sitting down. The humorist by trade could manufacture some jests out of attitudes and movements, no doubt; his ingenuity works up less promising materials. But what is there for serious debate? Sitting down "comes natural"—like eating. Persons not hasty to grant that a thing must be fashioned by Providence for the use to which we put it may willingly allow that the thigh bones are padded in order that we may sit upon them without discomfort. Until lately, indeed, another purpose was assigned to those cushions. Our forefathers proved the manifest destiny of children to be whipped by the same anatomical arrangement; but logicians might call this a second cause. Anyhow, it has passed out of use. But if the operation be natural, all human creatures must sit down—and there is an end of the theory, for they do not. Reviewing, in fact, the population of the globe, it seems likely that the men and women who sit are less than ten per cent. To begin with, the millions of China and India must be excluded. Only the hundreds there turn the cushions to their destined use, so that more than one-half of mankind is excepted at a stroke! But that is not nearly all. Japan follows, with the lands and isles of the far East, Asia in general, the most part of Africa, the Indian territories of America, from the Arctic Circle to Cape Horn. When we look closely, it appears that only Europeans, their descendants, and those whom they have instructed, sit.

The custom is not universal, even in Europe. At the time of the war neither chair nor stool, rarely a divan, could be found in a Bulgar house, outside the towns; the table was only a foot high, and the family squatted round it on the floor. The Bulgars are not people to adopt a new fashion readily. Throughout the Balkan principalities, indeed, seats are an unnecessary article of furniture for the bulk of the population; even the divan is rare in a farmhouse of Albania and Montenegro. It is assumed that Turkish influence or example banished chairs and stools. That is improbable in any case; but when we observe that outside of Europe nearly all mankind squats, it becomes far more likely that these people follow the practice of their remotest ancestors. The Turk has simply arrested development at this as at other points.

Men who do not sit have two attitudes for resting; women use one of their own. Squatting "on the heels" is favored in India and China. In this position the weight of the body falls upon the toes, and to keep the balance comfortable the arms must lie over the knees, the hands dangling. A European trussed in this manner promptly feels a pain in his calves, but he can understand that habit makes it a restful posture. In fact, our colliers use it. There is a legend current in North Staffordshire referring to the embodiment of militia or volunteers—for authorities differ—early in the century. After divers eccentric maneuvers, the officer cried, "Stand at ease!" When his order had been explained, every man squatted on his heels like an Indian coolie. There is, however, a mode of resting practiced by some jungle tribes which is utterly incomprehensible. Being fatigued, these people stand on one leg and curl the foot of the other round the calf. The same extraordinary custom is seen in Africa. We ask, in bewilderment, why on earth they do not lie, or at least squat. It may be hazarded as a mere conjecture, without any pretense of justification, that they or their forefathers dwelt in swamps especially malarious. But the custom shows what unnatural usages men will devise before it occurs to them to sit down "like Christians."—New Review.

Fogs and Gas Burners.

That a London fog deprives coal gas of 11·1 per cent of its illuminating power will not surprise many of us, but that the searching light of an incandescent burner is robbed of as much as 20·8 per cent of its efficacy under such circumstances is certainly astonishing. The reason Prof. Lewes gives for this phenomenon is that both the spectrum of the incandescent and the electric light approach very nearly that of the solar spectrum, being very rich in the violet and ultra-violet rays, and it is precisely these rays which cannot make their way through a London fog. This is the reason why the sun looks red on a foggy day; the violet rays are absorbed by the solid particles floating in the aqueous vapor of the atmosphere, and only the red portions of the spectrum get through. The old Argand burner is much more successful in battling with a London fog than either of its more youthful and fashionable rivals.

DR. FRANK BOAS, Curator of the Anthropological Section of the American Museum of Natural History, and Dr. Livingston Farrand, of Columbia University, started on the 25th of May on one of the expeditions for the museum, for which Mr. Morris K. Jesup, the president of the institution, has provided a fund. The two scientists will go into British Columbia, where about thirty Indian dialects are spoken, and mingle with the Indians in the effort to obtain accurate knowledge of the dialects and information about the habits and daily life of the Indians. They are expected to return in October with a large quantity of material to enrich the museum.

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RECENTLY PATENTED INVENTIONS.

Engineering.

FEED WATER PURIFIER.—Julius Bruun, Copenhagen, Denmark. To automatically remove from the feed water for boilers matters which may produce sediment or incrustation, this inventor has devised an apparatus comprising a container for adding a suitable chemical solution or reagent for any special kind of water, an adjustable valve connection to regulate the amount discharged at each operation, and a movable feed apparatus adapted to discharge water into a tank, automatically bringing a predetermined amount of purifying material together with a certain amount of water in a purifying tank.

PNEUMATIC PROPELLER.—Albert A. Graham, Topeka, Kansas. This invention provides for the employment of an air blast to propel a vessel. Located in the hull of a vessel near the stern is a series of fans, to be rotated at different speeds, compressing the air as it travels outward, the fans discharging into an air duct which communicates with a passageway leading through the stern of the vessel, the air blast striking the water near the vessel's bottom, and by its expansion and pressure against the stern forcing the vessel along. The air duct is divided longitudinally by a pivoted swinging partition, by which a greater amount of air blast may be directed to one side or the other to steer the vessel.

Electrical.

INSULATOR.—William Christie, San Francisco, Cal. An insulated hanger for electric wires, patented by this inventor, effectually guards against leakage through conduction by atmospheric conditions, as rain, fog, dew, etc. The insulator consists of a metal casing having a bottom closure with opening near one side, an insulating material in the upper portion of the casing, from which a zigzag suspending rod extends through the opening in the bottom closure where it is connected with an insulating material to which the conducting wire is attached. Condensing plates are arranged within the casing under horizontal portions of the zigzag suspending rod.

Bicycles, Etc.

BICYCLE SUPPORT.—James W. Jacobs, Jeffersonville, Ind. According to this invention a supporting rod is vertically held at each side of the rear fork, the upper portion of each rod being movable through a guide ring adjustable at any desired angle with relation to the fork, and the guide ring having a set screw by which the rod may be secured as adjusted. The lower portion of the rod extends through a ring on a pivoted arm, which extends outwardly from a lug on a clamping collar attached to the lower portion of the fork member. By releasing the set screws in the guide rings the rods may be drawn up from the ground, or moved down in position to support the wheel, being held in the position desired by tightening the set screws.

Mechanical.

RIVETING MANDREL.—John F. Mantey, Patterson, Texas. To facilitate riveting the overlapping ends of sheet metal, to form pipes, tubes, etc., this inventor employs an anvil bar projecting from one side of a bench or table, and a rivet holder held movably on the bar and adapted to temporarily hold the rivets in position for engagement with the openings in the parts to be riveted together. The rivet holder slides on the upper surface of the anvil bar, and has a slot for receiving the head and part of the shank of the rivet. On the holder are also guides determining the movement of the holder forward and backward on the anvil bar.

PERFORATING MACHINE. — Cortland Carlton, Kansas City, Mo. A machine of inexpensive construction has been designed by this inventor for rapidly and uniformly perforating paper, the machine operating rapidly and being quickly adjustable to perforate the paper along different lines. The perforator is mounted on a suitable frame, and fixed to a shaft is a cylinder having a recessed portion into which passes a gripper frame carried by the shaft, the frame being adjustable around the shaft and throughout the length of the recessed portion of the cylinder. The frame carries a periodically operated gripper, and the arrangement is such that several sheets of paper may be perforated at once or a wide sheet may be perforated along different lines.

Railway Appliances.

NUT LOCK.—Charles T. Redfield, Glen Haven, N. Y. This is a device especially adapted for use on rail joints, although applicable for other purposes. The rail, fish plates, bolt and nut may be of the ordinary pattern, and a base plate with openings for the bolts fits against the fish plate. Placed against the base plate is a lock plate having a bolt opening and flange overlapping the base plate, and at one end the lock plate is folded back, forming a spring tongue to fit alongside the edge of the nut. By the bowing of the main portion of the plate a double spring is secured, and the straightening of the main portion as the nut is turned home tends to increase the tension of the tongue.

Agricultural.

CATTLE FOOD COMPOUND.—Fritz V. Friderichsen, Copenhagen, Denmark. As a new article of manufacture, this inventor has patented in the United States, and in nearly all the countries of the world, a method for using blood in food for cattle in such manner that the blood will be preserved and the product will not deteriorate when kept for years. It consists in adding to the blood about twenty-four per cent of treacle or molasses, and then allowing this mixture to be absorbed by one or more of the ordinary kinds of forage commonly used in the trade, the forage forming the body of the product, which is made into cakes or into a coarse powder. The quantity of forage added is to be so regulated that the final product will contain nitrogen, fat and carbohydrates in suitable proportions.

PLOW DRAUGHT ATTACHMENT.—Walter H. Nelson, Northport, Mich. This patent is for improved clevises and swivels, enabling the connection to be bent in any desired direction. The clevis has a hole through its body at the central bend, and an intermediate clevis has double jaws at each end, each pair of jaws being at right angles to the other, while a swivel clevis has an eye at the outer end of the swivel bolt. The jaws of the intermediate clevis are perforated, and adapted at each end to embrace the central bend of the first clevis and the eye of the swivel bolt, and pivot pins join the parts together. This connecting device permits of any amount of twisting or bending without becoming tangled.

HARVESTER BINDER.—Frank G. Grove, Luray, Va. This is a self-binder which is applicable to and may be used upon any side delivery harvester, and in which the driving power may be derived from the rake shaft or other moving part of the harvester. A packer head reciprocates toward and from a binder shaft, there being a projecting looped arm on the head which engages an arm on the binder shaft. The binder shaft supports a needle arm and two crank arms, one of the crank arms having for its function to co-operate in positively pressing the needle to binding position and return. Racks operate a pinion to cause a discharging arm to first aid in compressing the sheaf, and then, by a continued movement, to forcibly discharge the sheaf from its holder.

Miscellaneous.

FIREARMS LOADING MECHANISM —Alpheus B. Harmon, Havelock, Iowa. To automatically load small arms, such as repeating rifles and shot guns, this inventor provides a simple and positive mechanism designed for ready application to any of the firearms as now constructed. A pitman pivoted to the breech block extends rearward through the hollow stock to a wrist pin on a crank wheel, on whose shaft is a pinion meshing with a gear wheel on a shaft extending out of the stock, and on which is a boxing carrying a spring, one end of which is secured to the boxing and the other to the shaft. Attached to the boxing or spring barrel is a folding crank, and the boxing has ratchet teeth engaged by a spring pawl. After the magazine is charged the spring is wound by turning the boxing. Immediately after firing, the crank wheel is rotated, drawing the breech block back, ejecting the exploded shell and placing a cartridge in position, and the backward movement of the breech block moves the hammer to a cocked position.

SOLAR ATTACHMENT FOR TELESCOPES. —Peter Stoller, Pitkin, Col. This attachment is more especially designed for telescopes used by engineers for making observations for taking time or for determining latitude, the time being known. The telescope is mounted equatorially on a frame constructed for attachment to the standard of an engineer's transit, or to any other suitable telescopic stand, the telescope being provided with adjustments for latitude and for hour angle and declination, with verniers connected with each adjustment.

PERMUTATION LOCK.—John A. Henry, New York City. This is a lock which may be readily thrown into locked or unlocked position, or it may be employed as a latch. Combined with actuating spindles is a series of independent tumbler plates, each having diagonal guide recesses on its opposite faces, and each having its obliquely opposite edges beveled, the tumbler plates being on a rotary plate with which the latch bolt engages, and the spindles being detachably connected together, one of them being passed through an elongated opening in the rotary plate. The several tumbler plates are held in place by an actuating ring, and the tumblers are arranged to a certain scheme of numbers determined by the diagonal channels.

PRINTING APPARATUS. — Julius G. Hocke, Bayonne, N. J. This is an apparatus for printing a set of characters on a shipping receipt or similar paper, and at the same time printing a separate check or ticket with duplicate characters. A swinging frame carries two printing devices, one for printing a blank ticket and the other for printing duplicate characters on a receipt, each printing device comprising a set of type wheels and means for setting both sets of type wheels simultaneously, to bring the same type characters into printing position, there being also a set of consecutive numbering wheels for each printing device, the wheels being automatically actuated by the swinging of the frame.

TYPEWRITER DESK ATTACHMENT. — Fred L. Boynton, Kingfisher, Oklahoma Ter. This attachment comprises a corner post adapted to be hinged to the corner of a desk, so that it may be turned to the front of the desk or to one side, the post carrying a hinged section or drop leaf, with props movably engaging the post at their lower ends and bearing at their upper ends beneath the drop leaf. The props permit the compact and easy collapsing and downfolding of the hinged section, which may then be swung around against one side of the desk.

FOUNTAIN PEN.—Carl J. Renz, New York City. This is a pen in which the supply of ink may be shut off by manipulating the nib tube, when the pen may be carried point downward in the pocket without leakage, and when the supply is cut off from the barrel to the nib or pen proper the surplus is automatically drawn within the casing and held in storage. The feeder is also designed not to clog, while serving both to deliver and to store the ink, as well as supplying ink to the pen and regulating the supply from the barrel or reservoir to its conducting channels.

DEODORIZING OILS.—James R. Whiting, Stamford, Conn., and William A. Lawrence, Waterville, N. Y. To refine and deodorize the lighter products of petroleum, this inventor has devised a process and apparatus according to which the oil is first reduced to a vapor, then passed through charcoal and then through lime water, the vapor being then condensed. The apparatus comprises a heating cylinder in which the vaporization is effected, and a container for charcoal having communication therewith, while a lime water cylinder communicates with the container and a condenser is in communication with the lime water cylinder It is found that the refined solvent is greatly enhanced in value and usefulness.

FUNNEL. — Thomas Borcher, Jersey City, N. J. This is a plug or measuring funnel, whose bowl may be filled as desired without the liquid entering the nozzle, the latter being closed by a tightly fitting plug valve on the lower end of an angle lever, whose outer end rests and is held on a bearing on the edge of the bowl. When this end is pressed downward the valve is raised to allow the liquid to flow out of the bowl, the valve being held open when desired by a pivoted link to be passed over the handle end of the lever.

PUMP.—Ralph W. Elliott, Brentwood, Cal. This invention provides a substantially automatic mechanism designed to force water from deep wells to a high level by the explosion of a gas. Operating in a large cylinder is a piston through whose tubular stem extends a valve-controlled pipe connected with a gas or gasolene tank, and adapted to admit explosive material above the piston. The piston is drawn upward by a spring which surrounds its stem and abuts against the upper end of the cylinder, the water being at the same time drawn in through the inlet valve, and near the upper end of the cylinder is a contact point adapted to make contact with another contact point on the piston stem, when it reaches its upper limit, both contact points being provided with suitable electrical connections to afford an electric spark by which the explosive material is ignited, the explosion driving the piston downward.

HOOK HANGER.—Charles T. Redfield, Glen Haven, N. Y. This is a hook for hats or coats, etc., formed of a single piece of bent wire to make upper and lower upwardly curved hooks of double sections of wire, each end of the wire being bent at right angles and having a spur or prong adapted to enter the rear face of a strip of wood. The device forms a firm support and may be cheaply made.

ANTI-RATTLER THILL COUPLING. — Charles T. Redfield, Glen Haven, N. Y. An anti-rattler device of simple and inexpensive construction is provided by this invention, one which may be applied to the ordinary coupling without change, and is applicable alike to round or square coupling bolts, serving the purpose of a bolt lock, a nut lock and an anti-rattler. It consists of a plate having its intermediate or main portion bowed slightly upward, and at one end an upturned flange to rest alongside of the nut, while at the opposite end is a bolt wing at an acute angle to the main portion and having a flange to overlap the bolt head.

SPIRAL SPRING ATTACHMENT.—James Brown, Carlton, Victoria. To connect spiral springs more readily to the articles to which they are attached, according to this invention, the legs of a U-shaped attachment, with enlarged bowed portion, are entered within the coils, the ends of the legs being bent to form each a hook, engaging the opposite end of the coil. A similar attachment is entered from each end of the coil, and the legs are preferably made in two portions connected by turnbuckles for adjustment to the desired length.

TRAVELING BASKET.—Wilhelm Sievert, New York City. A basket adapted to take the place of a trunk, according to this invention, has a broad top rim, a cover with downwardly extending edges formed of bars interwoven with material, and a cleat around the lower edge of the cover having openings in which the bars are fitted. The construction is designed to maintain at all times the shape of the basket and prevent the cover from spreading when pressed on or being crushed in.

WATER ELEVATOR.—Herbert L. Poe and William C. Sparkman, Southmayd, Texas. This invention is for a novel arrangement by which a bucket may be continuously raised and lowered in a well to lift and discharge water therefrom, the operation continuing automatically. The power is supplied from an operating shaft, and a support or plate is movable across the path of travel of the bucket when it is raised to open the bucket valve, there being also an operative connection from the hoisting device with the plate or support to move it out of the path of the bucket when the latter has been emptied.

BOTTLE CLOSURE.—Peder K. Mannes, West Duluth, Minn. To prevent the use of a bottle a second time, without showing that it is so reused, this inventor has devised a bottle with an opening in one wall of its mouth, interior grooves communicating with the opening, and a closure plate extending through the opening and fitted in a groove. The plate has recesses communicating with each other by a groove, in which is a spring whose free ends engage with the walls of the mouth of bottle. The plate cannot be removed without fracturing the neck of the bottle at the points where the recesses are located.

CHRISTMAS TREE HOLDER.—Peter J. Kelly, New York City. This holder has three legs, pivoted near their upper ends to a retaining ring, their upper ends being adapted to engage and clamp trees or staffs varying considerably in size. The smaller staff spreads the feet of the legs a little more than the larger one, but the heavier the object, the firmer it will be held, all sizes being held securely.

MAIL BOX.—William D. Jones, Homestead, Pa. This is a box for the reception of mail matter and is made in hinged sections, spring controlled, to fold flat against the back of the box when the latter is empty. The box is designed to be used mostly for newspapers and as an advertising medium, there being ample space for an advertisement. It is open at the bottom and has a cover to protect its contents, and when papers are placed in it the box may be brought to the shape of an ordinary mail box, the parts returning to folding position and clamping the inserted mail matter between its front, sides and back.

ANIMAL TRAP.—Job T. Wells, Cando, North Dakota. This is a simple and inexpensive self-setting animal or bird trap, comprising a cage having at one end a gangway connected by a side passage, rockable gates closing the ends of the gangway, while a rockable platform has a device extending from its pivot support to a tilting table, the gates and platform being connected, and the movement of the platform controlling the gates and tilting table. The animal must tread upon the platform to reach the bait.

Designs.

BUCKLE.—Henry E. Smith, Newark, N. J. The principle novelty of this buckle consists in a panel having the appearance of being inserted in and extended lengthwise of the front bar of the buckle loop, the junction being on diagonal lines and the panel contrasting with the side portions of the loop.

HAT SUPPORT.—Harriette G. Cozzino, New York City. This is a support to be applied more especially to theater chairs, and has a portion curved to correspond to the back of the chair, a back member adapted to serve as mirror, and two oppositely curved portions adapted to serve as hat supports.

SASH BELT.—Mark Aronson, New York City. The leading feature of this design comprises panels inserted transversely of the longitudinal plaits of the body of the belt, there being also a bow ornament on one end.

SEAT TOP. — Frank B. Burns, New York City. This seat top is round and is made of a series of small cushions, in lines at right angles to each other, the plan being square in outline and the corners being recessed by the circular heads of the securing nails. Each cushion is defined from the other by creases.

DRUM.—Orville R. Noble, Granville, Mass. According to this patent, the drum body band comprises flags of stars and stripes in relief, with pronounced relief border and staffs for the flags, and also with cords and tassels in relief.

NOTE.—Copies of any of the above patents will be furnished by Munn & Co. for 10 cents each. Please send name of the patentee, title of invention, and date of this paper.

NEW BOOKS, ETC.

WARNER'S POCKET MEDICAL DICTIONARY. Philadelphia: William R. Warner & Company. Pp. 304. Price 75 cents.

This is a concise little handbook giving the pronunciation and brief definitions of 10,000 words and terms used in medicine and associated sciences.

THE BOOK OF THE DAIRY. A Manual of the Science and Practice of Dairy Work. Translated from the German of W. Fleischmann, by C. M. Aikman and R. Patrick Wright. London, Glasgow and Dublin: Blackie & Son. New York: D. Van Nostrand Company. 1896. Pp. xxiv, 344. Price $4.

Dairy practice is no longer a matter of the farm yard; it has rather become a question of science applied to the development of the greatest possible amount of cleanliness. The title of the book, which we quote in full, gives its scope, and an examination goes to show how very complete it is, and how adequately the modern dairy or milk factory is treated. The allied subjects are also included, for the book, in addition to telling of the titular subjects, also speaks of cheese and margarine, of the condensation of milk, of the use of antiseptics, and of the chemistry of the subject. It should be a sine qua non of the dairy farmer, amateur or professional.

GEOLOGICAL SURVEY OF ALABAMA. Eugene Smith, State Geologist. Report on the Valley Regions of Alabama (Paleozoic Strata). By Henry McCallet, Assistant State Geologist. With illustrations. In two parts. Part I. On the Tennessee Valley Region. Montgomery, Ala. 1896. Pp. 436.

AN INTRODUCTION TO GEOLOGY. By William B. Scott. New York: The Macmillan Company. London: Macmillan & Company, Limited. 1897. Pp. xxvii, 573. Price $1.90.

This contribution to geology from Prof. Scott of Princeton College, is an excellent example of the modern treatment of science, making the subject one of general interest and getting rid of much of the dryness ordinarily supposed to be a necessary accompaniment of geology. It is most interestingly illustrated, partly with half tones, nature being called upon directly to furnish the illustrations, while woodcuts are also used as required for special cases. It is certainly a most attractive feature to employ the absolute reproduction of natural scenery to cover the ground of rock phenomena. The latter portion of the work is devoted to paleontology and is largely illustrated by special woodcuts. An excellent index closes the work, nearly 23 pages being devoted thereto.

DES INGENIEURS TASCHENBUCH. Herausgegeben vom Akademischen Verein. Hütte. Sechzehnte, Neu Bearbeitete Auflage. Mit über 1,100 in den Satz Eingedruckten Abbildungen und Zwei Tafeln. Berlin: Verlag von Wilhelm Ernst & Sohn. 1896. Pp. vi, 984. Price $6.40.

The size of these two volumes, including over 1,500 pages, with independent indices, would remove them altogether from the American idea of a pocket book, although the liberal ideas of the Teutons on the subject allow them to be so named. They are far too exhaustive to be reviewed within the limits of our space. They really represent a treatise on civil and mechanical engineering, with very numerous illustrations and limitless formulæ. Electricity and technology are also treated to a considerable extent. The work is in many aspects naturally of the German class distinctively. As an instance we may cite the table of money values, referring to the German mark and its subdivisions. The tables of weights and measures are really very exhaustive and worthy of every commendation, and may be used as an illustration of the

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high merit of the work. The Roman type is used throughout.

ANGEWANDTE ELEKTROCHEMIE. Erster Band. Die Primär und Secundar Elements. Von Dr. Franz Peters. Wien, Pest, Leipzig: A. Hartleben's Verlag. 1897. Pp. xiv, 338. Price $1.20.

This book is one of the attractive German monographs of which so many have appeared from this publishing house. It is devoted to batteries, primary and secondary, and in its three hundred-odd pages the subject of batteries, wet, dry, thermo and secondary, is really most excellently treated, with numerous and quite satisfactory illustrations. The thoroughness of the treatment is testified to by nearly a six page registry of names of the batteries mentioned in the text.

CORPORATION BOOKKEEPING IN A NUTSHELL. With an appendix containing a chapter on the Treatment of Manufacturing Accounts, the Latest and Most Approved Rules for Averaging Accounts, the Shortest and Best Rules for Computing Interest, Rules for Locating Errors in Trial Balances, Short Cuts in Figures, etc. By P. H. Grover. Detroit, Mich.: The Bookkeeper Company, Limited. 1897. 8vo. Pp. 94, tables. Price $2.

Strange to say, the science of accounting is still in a transitory state, so that there are constant demands for shorter, clearer and more intelligent methods of recording the transactions. The present work is devoted to probably the most complicated form of bookkeeping that is in use by large corporations, requiring summaries, tabulations, statement sheets, etc. It gives a clear exposition of the modern methods which are employed. The author shows a familiarity with the most complicated forms of trial balances, involving one-half dozen different corporations.

EMBALMING AND EMBALMING FLUIDS. With the bibliography of embalming. By Charles W. McCurdy. Wooster, Ohio: The Herald Printing Company. 1896. Pp. 84. Price $1.

The thesis of Prof. McCurdy is unique. It is in no sense of the word a practical guide to the professional embalmer, but is a scientific treatise upon embalming and embalming fluids. A large part of the work is devoted to a bibliography of embalming. It is one of the most complete special bibliographies which has ever come under our notice.

THE POLARIZING PHOTO-CHRONOGRAPH. By Albert Cushing Crehore, Ph.D., and George Owen Squire, Ph.D. New York: John Wiley & Sons. Pp. 150, with numerous plates. Price $3.

A Dartmouth College professor and an army lieutenant attached to the United States Artillery School give an account in this book of experiments made in developing the perfected instrument now principally used in determining the velocities of projectiles. The unit of time to be dealt with in such experiments is so very small that the work of designing and constructing a practically efficient instrument has been participated in by numerous experimenters, whose labors have extended through several years. In trials inside the bore of a three inch field gun, the recorded times bore about the same relation to a second as a second does to a third of an hour. The basis of the chronograph is the influence of the magnetic field as generated by the electric field upon light, the use of light as an agent being greatly facilitated by the recent development of rapid photographic plates, some records on sensitive plates having been made by exposures of only 1-100,000 of a second. The new instrument, with which the more recent experiments were conducted, was made by J. A. Brashear, of Allegheny, Pa., and the measuring instrument for it was made by Warner & Swasey, of Cleveland, Ohio.

MAINTENANCE OF WAY STANDARDS ON AMERICAN RAILWAYS. Chicago: Roadmaster and Foreman. Pp. 557. Price $2.

This book contains a great amonnt of technical information and rules and instructions governing roadway departments of the leading railways of the United States. The forms of reports required from roadmasters, section foremen, and all who have supervisory duties relative to the construction and repairs of the different roads, together with minute specifications of important details, are here given in a way to facilitate comparison, and be of assistance to the practical railroad man.

SANITARY HOUSE DRAINAGE. By T. E. Coleman. New York: Spon & Chamberlain. Pp. 186. Price $2.

A convenient handbook for architects, engineers and builders is here presented, with the matter and illustrations so arranged as to place the subject well within the comprehension of any nontechnical individual who wishes to supervise or plan such work for his own dwelling. A good deal of attention is given to the ventilation, flushing, and cleansing of drains, a thorough, safe construction of good capacity being strongly recommended.

PRACTICAL GAS FITTING. New York: David Williams. Pp. 116. Price $1.

This book is a reprint of two illustrated articles originally appearing in the Metal Worker, and written by J. W. Hughes and W. B. Gray, both practical gas fitters. The different manner in which these two workmen treat their subject cannot but be of interest to plumbers and others interested in this class of work.

HOT WATER MANUAL. By Walter Jones. Chicago: The American Artisan Press. Pp. 220. Price $3.

This book contains information and suggestions on the best methods of heating public, private, and horticultural buildings, treating on the high and low pressure systems, duplicate boilers, radiators, swimming baths, Turkish baths, etc.

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The charge for insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in the following week's issue.

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See illustration, front page of SCIENTIFIC AMERICAN, April 24. It is manufactured by the Lidgerwood Mfg. Co., 96 Liberty Street, New York. Write for particulars.

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Names and Address must accompany all letters or no attention will be paid thereto. This is for our information and not for publication.

References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all either by letter or in this department, each must take his turn.

Buyers wishing to purchase any article not advertised in our columns will be furnished with addresses of houses manufacturing or carrying the same.

Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.

Scientific American Supplements referred to may be had at the office. Price 10 cents each.

Books referred to promptly supplied on receipt of price.

Minerals sent for examination should be distinctly marked or labeled.

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JUNE 8, 1897,

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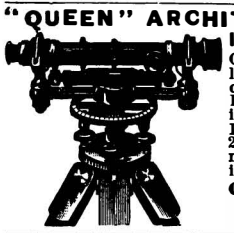

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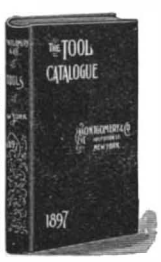

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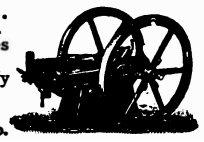

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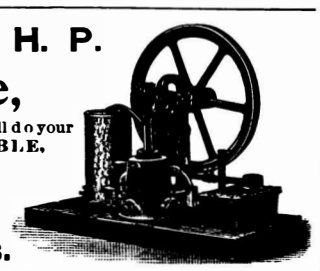

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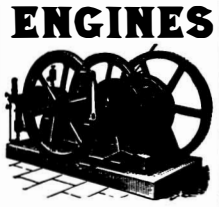

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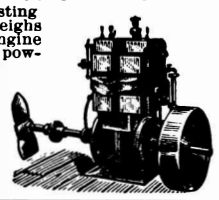

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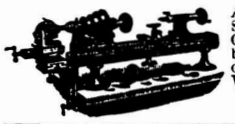

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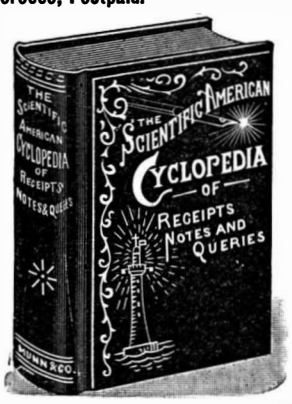

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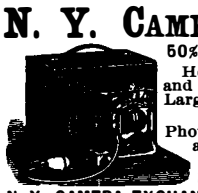

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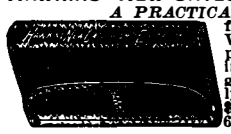

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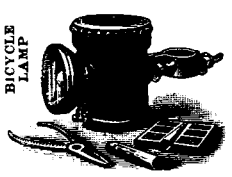

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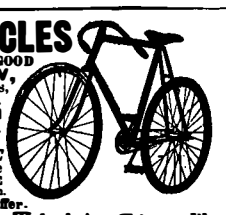

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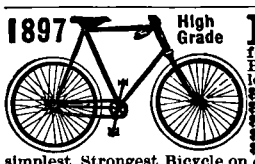

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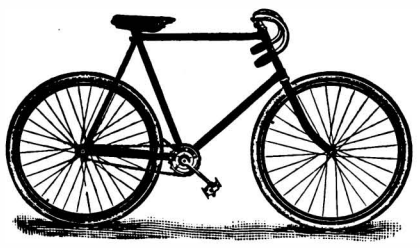

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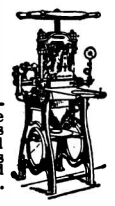

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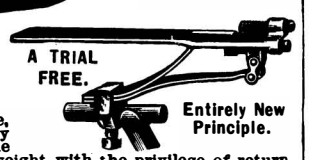

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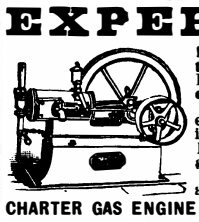

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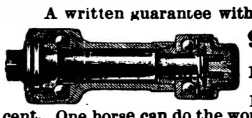

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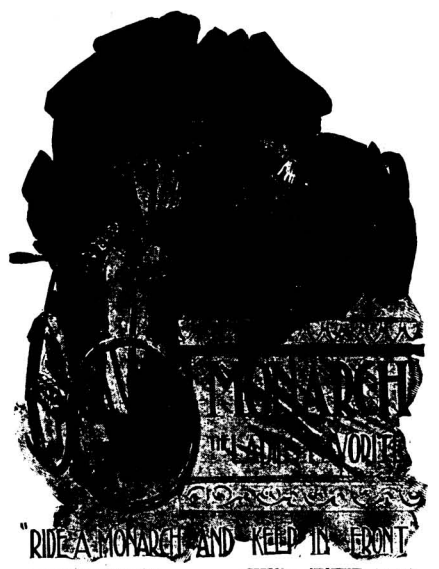

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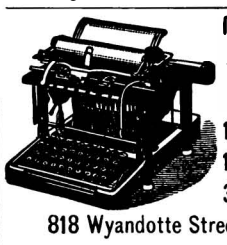

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